No 2659 VOLUME 77 FRIDAY 26 FEBRUARY 1960

FLIGHT

AIRCRAFT, SPACECRAFT, MISSILES

Official Organ of the Royal Aero Club First Aeronautical Weekly in the World Founded 1909

Editor-in-Chief
MAURICE A. SMITH DFC

Editor
H. F. KING MBE

Technical Editor
W. T. GUNSTON

Production Editor
ROY CASEY

IN THIS ISSUE

From All Quarters 262
Defence Reports and Estimates 264
Mr Sandys' Blank Cheque 266
Missiles and Spaceflight 267
Selecting Pilots for the Civil College 271
The Independents and the New Bill 273
Middle East Air Force 274
Firestreak 277
Straight and Level 281
Flight System Survey 282
The Bill and the Board 283
Oldest Aeronautical Society 284
Sport and Business 286
The Industry 287
Correspondence 288
Service Aviation 289
Air Commerce 290

Iliffe & Sons Ltd, Dorset House, Stamford Street, London SE1; telephone Waterloo 3333. Telegrams Flightpres Sedist London. Annual subscriptions: Home £4 15s. Overseas £5. Canada and USA $15.00. Second Class Mail privileges authorized at New York, NY.

Branch Offices Coventry: 8-10 Corporation Street; telephone Coventry 25210. Birmingham: King Edward House, New Street, 2; telephone Midland 7191. Manchester: 260 Deansgate, 3; telephone Blackfriars 4412 or Deansgate 3595. Glasgow: 268 Renfield Street, C2; telephone Central 1265.

New York, NY: Thomas Skinner & Co (Publishers) Ltd, 111 Broadway 6; telephone Digby 9-1197.

© Iliffe & Sons Ltd, 1960. Permission to reproduce illustrations and letterpress can be granted only under written agreement. Brief extracts or comments may be made with due acknowledgement.

Ballistic Mobility

THIS year the marrow of that great white bone of contention the *Report on Defence* was a sentence recording a decision not to rely exclusively on fixed-site missiles in succession to medium bombers armed with the stand-off powered bomb. This had led to a resolve to investigate the possibilities of mobile launchers, "whether aircraft or submarines," for delivery of nuclear warheads.

The statement was variously savoured by Fleet Street as the tolling of the bell for Blue Streak; as evidence of discord in high places; and as just another manifestation of scientific progress. Certainly it was a sentence worth deliberating—first for its reference to air launching. What seems to have been missed here is the possibility of adapting the V-bombers for the launching of some such weapon as the American Skybolt, now under development as the primary armament of the B-58 and equally applicable to the B-52. This weapon has a range of 1,000 miles.

Should a wholly new aircraft type be found necessary or desirable this might well be a version of a supersonic transport; indeed, Britain's first such transport might even take the form of a multi-mission aircraft for both military and civil use. On the other hand it could be a subsonic VTO vehicle, or even a conventional propeller-driven aeroplane.

Quite aside from these airborne possibilities—utilizing a special missile, perhaps of American origin—it would appear that our own Blue Streak might itself achieve a useful degree of mobility could it be transported by rail and launched from a special truck or emplacement. Already a special train has been developed for the American Minuteman (carrying two of these multi-stage solid-propellant rounds) and this new form of weapon system should be available for service about two years hence.

The possible benefits of such a scheme—not least to British Railways—demand their own due consideration in the current Ministerial investigation.

New Deal for Air Transport

FUNDAMENTAL changes in the structure of British aviation are recorded in this issue of *Flight*. The manufacturing industry becomes more of a monopoly, the airline operating industry—by the repeal of the notorious Section 24 of the Air Corporations Act of 1949—becomes less of a monopoly. Competition among British manufacturers is virtually eliminated, except in the case of the D.H.121 and the VC11, while competition among British airlines is approved in principle.

The new aircraft industry will depend largely for its future bread and butter upon the airlines. Since the market for new British civil aircraft must be primarily a home market, the key to the prosperity of British aviation as a whole is thus the healthy expansion of British air transport. It follows that the body concerned with the broad economic regulation of this expansion is a very important body indeed. Its constitution should ensure that it is fully equipped to discharge the great responsibilities it will bear for the advancement of British aviation in the widest sense.

Unfortunately, the Civil Aviation (Licensing) Bill that Mr Sandys presented to Parliament last week proposes the establishment of an Air Transport Licensing Board which appears to fall far short of this conception. The proposed Board will not, if the thoughts on page 283 are accepted, be the powerful autonomous instrument that had been hoped for.

FROM ALL QUARTERS

Supersonic Airliners: Minister's Statement

CO-OPERATION between the Government and the aircraft industry in the development of a supersonic airliner was announced in the House of Commons last Monday by Duncan Sandys, Minister of Aviation. Study contracts, he said, were being placed with the major airframe and engine groups. The Minister's statement is given in more detail on page 290.

Low-level Salute

THIRTY-SIX Hunters of RAF Fighter Command appeared over Trafalgar Square at exactly 1300hr last Saturday, as planned, in salute to the Queen on the birth of her second son. In a message sent shortly afterwards to the Air Minister, George Ward, the Queen said: "I and my husband greatly appreciated the salute of the RAF this afternoon. Please thank all ranks and particularly all those concerned in the fly-past. Elizabeth R."

It had been planned that the Hunters should fly at not less than 2,000ft, but as the cloudbase was lower than this they actually came across at about 900ft. In all other respects, however, the fly-past went off as planned with three formations of 12 crossing London via Trafalgar Square and Westminster then turning eastwards near Streatham on a course to Hornchurch and Chelmsford, after which the formation broke up, aircraft of the six squadrons involved (Nos 1, 54, 56, 65, 92 and 111) returning to their home stations. *Picture: opposite page.*

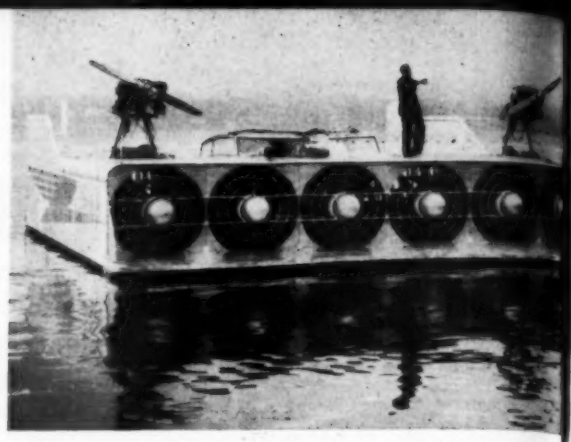
Edwardian Oration

TRENCHARD was the underlying theme of Sir George Edwards' lecture at RAF Halton last Monday evening; and appropriately, for this was the third Trenchard Memorial lecture, a likeness of the great Marshal flashed on the screen at the beginning and end of Sir George's talk. Appropriately, too, since a large proportion of the Halton RAeS branch audience was made up of young apprentices from No 1 School of Technical Training, Sir George stressed Trenchard's great personal qualities: vision, conviction, courage and tenacity.

On the basis of a well-founded Air Force, and with an audience who might be harbouring a future CAS in its apprentice ranks, Sir George hazarded a look into the future. He did this quite simply, by commenting on diagrams showing what equipment the RAF has now—under five headings: transport aircraft; strategic systems; tactical weapons systems; air defence; and maritime reconnaissance—and what it might expect to have over a 40-year time-scale.

Some of his comments and prophecies were particularly interesting, for example on the Russian space-programme: "When the man at the top says let's go, they all help or get out of the way"; on NATO: "I think an essential part of the strength of the West will be a strong British Air Force"; on Transport Command, that its Britannias and Comets would eventually be succeeded by M3 turbojets; on transport aircraft design concepts: "I think there is a strong case for a vehicle that can do more jobs than just carry men"; and on the B-70: "There are ugly rumours going round that this aircraft is to be turned into a transport."

Sir George was thanked first by Air Marshal W. H. Kyle, AOC-in-C Technical Training Command, and then (at a dinner in Halton House) by Peter Masefield. The president of the RAeS expressed gratitude for the "Edwardian (or Georgian) oration" with his usual felicitousness, comparing the forty years over which Sir George had looked ahead with the forty during which Trenchard had guided the destinies of the RAF.



SUCCESS has recently crowned the efforts of Karl Weiland, the inventor of the Swiss hovercraft "Ilen," the prototype of which was destroyed by a storm shortly after launching on Lake Zurich. On February 13 the craft achieved an observed speed of 43.5 m.p.h. It is the largest ground-effect machine yet demonstrated

New Fairey Directors

DIRECTORSHIP changes have been announced by the Fairey Co Ltd. Geoffrey W. Hall continues as chairman but relinquishes his appointment as managing director, being succeeded by C. H. Chichester Smith. C. C. Vinson has been appointed an additional director, and L. S. Dawkins likewise, the latter retaining his position as secretary.

Mr Smith joined the Fairey Aviation Co board in 1942, when he was general manager of the Stockport group of Fairey Aviation factories. The following year he moved to Hayes to become general manager and subsequently joint assistant managing director of the Fairey Aviation Co Ltd. When the parent company was re-organized last year as a holding company (the Fairey Co Ltd) with eight subsidiary companies, he became chairman of its two new subsidiaries, Fairey Aviation Ltd (recently sold to Westland) and Fairey Engineering Ltd. Mr C. C. Vinson is re-joining Fairey after an absence of eight years, during which time he was a business consultant. Mr Dawkins joined the Fairey Aviation Co at Hamble in 1936, became chief accountant in 1948, commercial manager in 1952 and secretary in 1956.

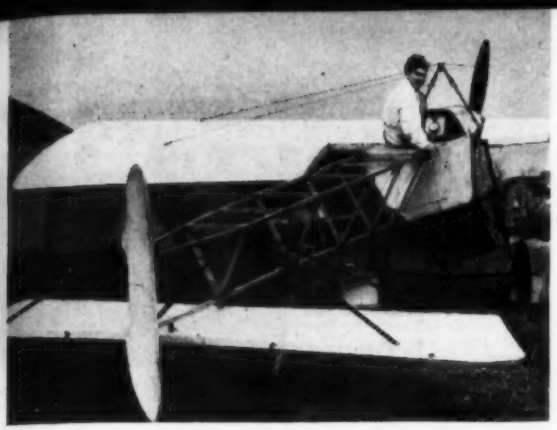
C. H. Chichester Smith and L. S. Dawkins

TECHNICAL TEAM who will assist the Indian Air Force on Avro 748 production are seen here with S. G. Joy, company director and general manager, before leaving for Kanpur on February 17. L. to r.: William Staniforth, foreman, aero tooling; Ernest Turner, planning engineer; Mr Joy; Jack Wood, foreman jig fitter; and Harold Whittaker, technician. J. Turner (not in picture) is also leaving with the team, and W. W. Gibb, team leader, is already at Kanpur

Parliamentary Interest in Private Flying

IN spite of forbidding weather, sixteen aircraft arrived at Little Snoring, Norfolk, for the opening 1960 rally arranged by the Fakenham Flying Group. This Popular Flying Association Group started in a very small way some years ago and, by a combination of energy and enthusiasm, has now reached the point of being a healthy concern operating eight aircraft. Thanks to the PFA co-ownership system, their Tigers cost under two pounds an hour to operate.

The presence of two Irish peers and two Members of Parliament at the meeting added an unusual flavour to the proceedings. The secretary of the Conservative Parliamentary Aviation Committee, Gp Capt R. C. Collard, in whose honour the meeting had been



HELPED BY DAD—"Doug" Bianchi of Personal Plane Services, Ashford —13-year-old Anthony Bianchi has constructed this full-scale replica of a 1912 Vickers monoplane. The drawings were loaned by Vickers

ROYAL SALUTE: To mark the birth of the Queen's second son 36 Hunters of RAF Fighter Command flew over London on February 20. This was the scene as they came in over the National Gallery, Trafalgar Square. News item on opposite page

arranged, spoke of his interest in the activities of light aircraft and later flew both the Lancashire Prospector and the Rollason Turbulent—experiences which he seemed to enjoy greatly.

The Earl of Bective flew a Prospector up from Fair Oaks and a second one arrived from Blackpool. Three Piper demonstrators —Caribbean, Comanche and Apache—were there, the Marquess of Kildare bringing with him in the Apache J. A. Leavey, MP. Aviation Traders sent up the "seven-seater" Prentice, and other aircraft present included four Turbulents, a Jodel, Tigers, Jackaroo, Auster and Cygnet.

Avons in Spate

REVIEWING service last year by Mk 117 Avons in DH Comet 2s of RAF Transport Command, Rolls-Royce Ltd stated recently:— "The Rolls-Royce Avons Mk 117 powering the de Havilland Comet 2s of Transport Command completed 35,932hr in 1959, bringing the total engine hours since Comet 2s entered squadron service to 100,076. During 1959 there were only three unscheduled engine removals due to causes within the responsibility of Rolls-Royce. Two of these were returned after rectification and the remaining engine was overhauled, giving an unscheduled removal rate of one per 11,977hr."

F-104 Round-up

IT is difficult to assess the total world production currently authorized for all versions of the Lockheed F-104 Starfighter but the figure is certainly in excess of 2,000. At present the totals appear to be:

US Air Force, approximately 400. The performance of the original F-104A day fighter and F-104B two-seater has in several respects been disappointing, particularly in the matters of inability to operate as a weapon system in all weathers or in integration with the SAGE network. As a result aircraft of these models—about 150 in all—are being withdrawn from squadrons of Air Defense Command. Some may be supplied to Chiang Kai-Shek, and a considerable number are to be converted for use as pilotless drones. The later F-104C and D are intended to have full all-weather capability, and these are remaining in service with Tactical Air Command in the USA and Spain.

Canada: the overall programme for the Canadair CF-104 is for 200 aircraft costing $420m. The chief individual contracts are those of the prime contractor ($91.5m) and Orenda Engines ($80m). Canadair's designation for the aircraft is CL-90, and the first is due to fly in April 1961.

West Germany: total procurement amounts to 660 F-104Gs. The Germans hope to manufacture all but 96 of these, the others being a mixture of F-104Gs and F-104Fs made by Lockheed (first F-104F delivery is due in May). The Gs will be built by a consortium involving Dornier, Heinkel, Messerschmitt and Siebel, and the engines will be manufactured by BMW. The latter company recently said that about 550 J79s had been ordered by the German Government, that negotiations were in hand for the sale of 200 to Holland and that another 500 were expected to be bought by "other NATO countries, including Belgium, Italy, Denmark and Greece."

Belgium: total procurement will lie between 50 and 170 aircraft (see Holland).

Holland: total procurement has been unofficially estimated at 200 aircraft. The majority of these, together with those bought by Belgium, are likely to be manufactured by a consortium of Benelux firms, including Fokker, SABCA and Avions Fairey; engines may be made by FN. Some aircraft may be supplied from Germany and 20 F-104D two-seaters are being purchased from Lockheed.

Japan: again a total of 200 aircraft has been authorized, and it is expected that the majority will be assembled by Mitsubishi. Present plans call for this firm to deliver 180 F-104C-J fighters and 20 F-104D-J two seaters. Increased costs may eventually curtail this total.

IN BRIEF

Proposals for VTOL and STOL aircraft are to be put to the Government by A. V. Roe & Co Ltd.

We regret to record that Sir David Randall Pye, CB, MA, SCD, FRS, MIMechE, FRAeS, eminent in many branches of research died at his home in Surrey last weekend at the age of 73. He was an experimental officer and pilot with the RFC and helped in 1917 to produce a scheme for Britain's first anti-aircraft balloon barrage; then after returning to lecturing at Cambridge joined Air Ministry in 1925 as Deputy Director of Scientific Research, being appointed Director in 1937.

Dr Barnes Wallis appealed on Monday to metallurgists "to give us a material which will maintain its strength and elasticity at temperatures of 300°C." Opening the Engineering Materials and Design Exhibition at Earls Court he said that the supersonic airliner of the future would be required to travel at 4½ times the speed of sound for three or four hours on end; friction on the outer skin would rise to between 250° and 300°C. "Can anyone supply me with such material? If not, what you must do is set about producing it."

Today's (February 26) issue of *The Autocar* has as its theme "Choosing Your Car—New or Used"; and next Wednesday's (March 2) *Amateur Photographer* is a special Outdoor Number.

FOUR APPOINTMENTS were announced this week by Vickers-Armstrongs (Aircraft) Ltd. At right is R. H. Botterill, filling the newly created post of service controller at Weybridge Works. Below, left to right, are M. G. Crisp, appointed flight test manager after air experience with most Vickers products since 1943; Jack Rasmussen—he joined Vickers-Supermarine in 1931—who becomes customer relations officer; and J. B. Armstrong, formerly senior operations engineer and now made assistant sales manager (South America)

REPORT ON DEFENCE, 1960

Thunderbird

THE White Paper under the above title, published* on February 16, is chiefly notable for a reference by the Minister of Defence, Harold Watkinson, to the possibilities of mobile launchers, whether aircraft or submarines, for long-range delivery of nuclear warheads. This has been widely construed as meaning that the full realization of the Blue Streak programme is now in doubt, if not in jeopardy, notwithstanding Ministerial assurance that development is continuing. *Flight's* comments appear in a leading article in this issue.

Under the heading "Technical Requirements and Training," the White Paper remarks that weapons inevitably become more complex as their power and efficiency increases. This trend is illustrated by the greater demand upon electrical supplies now made by ancillary equipment. Whereas a Wellington of the last war needed some 5kW of electrical power for such equipment, a V-bomber needs about 140kW.

In the last five years the proportion of highly skilled tradesmen and the total strength of the RAF has gone up by 50 per cent. On the subject of manpower economy it is reported that work-study and allied techniques are in use on an increasing scale in all three Services. Studies in aircraft servicing in Bomber Command have increased aircraft availability by 10 per cent and have resulted in much higher utilization of manpower. The time taken to refuel, reload and check a Hunter in Fighter Command has been cut by half, and the number of men required reduced from nine to six.

Discussing weapons and equipment the White Paper reports:—

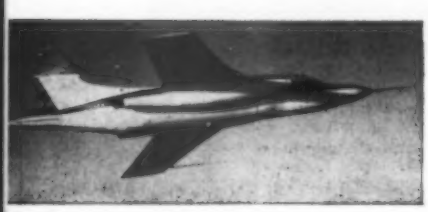
"The weapons of the future will depend on research work now in progress. For example, the problems of high-speed flight and kinetic heating are being studied with the help of the Bristol 188 stainless steel aircraft, which will make its first flight soon; the Short SC.1 research aircraft and the Hawker P.1127 are being used to investigate vertical take-off; and the problems of defence against ballistic missiles are also being examined. All the first five firings of the research rocket Black Knight have been successful."

The Canadian Beaver, it is recorded, has been chosen as a light liaison aircraft in support of the Army; and for anti-aircraft defence Thunderbird Mk 1 is now coming into service.

The points covered under the heading "Sea" are dealt with in our review of the Navy Estimates on this page. Under "Air" particular reference is made to the flight-refuelling programme for the V-bombers and arrangements being made with the United States authorities which will provide a ballistic missile warning system for this country. The paragraph which contains the reference to the possibilities of mobile launchers for missiles reads:—

"One of the aims of research and development in the field of the strategic deterrent is to devise a means of delivery that is invulnerable to the opposing defences. The development of the British ballistic missile Blue Streak is continuing. However, it may be decided not to rely exclusively on fixed-site missiles as the successor to the medium bomber armed with the stand-off powered bomb. Therefore the possibilities of mobile launchers, whether aircraft or submarines, for long-range delivery of nuclear warheads are being investigated."

Her Majesty's Stationery Office, London. Price 1s.



NA.39

THE NAVY ESTIMATES, 1960-61

THE *Explanatory Statement on the Navy Estimates*,† issued on February 17, contains the following nautical highlights: the first commando carrier commissioned; the first Sea Vixen squadrons in service; an aircraft carrier (HMS *Hermes*) completed; one guided-missile destroyer to be launched and three more on the slips.

The statement records that Her Majesty's ships in the Operational Fleet, or preparing for service with it, include four aircraft carriers (*Ark Royal, Hermes, Centaur* and *Albion*—to be relieved by *Victorious*) and one commando carrier (*Bulwark*).

The statement goes on to record that during 1959 the relationship between Royal Air Force Coastal Command and the Royal Navy was reviewed. It was decided that, although shore-based maritime air forces should continue to form part of the Royal Air Force, the Senior Naval Commander in each area at home and overseas would, from January 1, 1960, decide the operational task on which these aircraft were to be employed in maritime operations or exercises. He would then issue the necessary orders to the Senior Air Force Maritime Commander concerned.

At this stage in the report there is inserted an illustrated table headed "Twenty Years of Change," from which it may be learned that the carrier HMS *Hermes* cost £18m, will have a complement of 2,000 officers and men, and will carry over a hundred radar sets and W/T transmitters and receivers (cost over £1m). The sea area that can be searched in one hour is 360,000 sq miles, using two Gannet AEW aircraft by both day and night.

Dealing with carriers, the statement continues:—

"The 23,000-ton aircraft carrier HMS *Hermes*, equipped with the most modern air warning and direction system, has been completed and is expected to join the Fleet next summer. HMS *Ark Royal* has recently finished a large refit in Devonport Dockyard to enable her to operate the Sea Vixen. HMS *Eagle* is to undergo a full modernization which will enable her to exploit the full capabilities of the modern aircraft."

†*HM Stationery Office, London. Price 3s.*

The following remarks are made under the heading "Aircraft":—

"The re-equipment is complete of those front-line squadrons planned to receive Scimitar fighter/strike aircraft. The first squadron of Sea Vixen all-weather fighters is about to join HMS *Ark Royal*; more Sea Vixen squadrons are forming this year. A production order has been placed for the NA.39 low-level, long-range strike aircraft. Deck landing trials of this aircraft have been completed successfully in HMS *Victorious* and other trials will progress at an increasing pace. The Wessex helicopter, which can strike as well as hunt submarines in all weathers by day and by night, is undergoing service trials. During the year it will start replacing the Whirlwind.

"Trials to test the operation from a frigate of a small helicopter carrying an anti-submarine weapon have been successfully concluded. By this method it would be possible to extend a small ship's killing range to match the steadily increasing detection ranges.

"The first squadron of Gannets equipped for the airborne early-warning role has embarked in HMS *Ark Royal*. During the year these aircraft will replace the Skyraiders in other carriers."

In the guided-missile field, it is said, successful trial firings of the medium-range Seaslug continued throughout 1959 and further firings are planned for 1960. A substantial number of targets have been destroyed even by those missiles fitted with non-explosive warheads. Seaslug is now in production, and trials of Seacat, its close-range counterpart, are proceeding satisfactorily.

Additional information was forthcoming at a press conference. Commenting on *Hermes*, the First Sea Lord, Admiral Sir Charles Lambe, said she was a small ship but was equipped with all current aircraft control equipment and radar, two steam catapults and a "reasonably well-angled deck." She was capable of operating all Naval aircraft in service today. On the question of whether new aircraft carriers are to be built, he said he "would not subscribe to the view" that *Hermes* was the last.

Other points emanating from the conference were that the Navy at present had no plans for producing a missile submarine; and that guided-missile destroyers would possess an anti-submarine capability, through the employment of helicopters. The First Lord, Lord Carrington, when asked about amphibious warfare plans, said that there was nothing on the subject in this year's estimates "beyond a sum of money."

Sea Vixen, Scimitar and Seaslug

THE AIR ESTIMATES, 1960-61

THE following are the most relevant extracts, slightly edited, from the official memorandum on the Air Estimates, made public on February 18. The net total of Air Estimates for 1960-61* is £527,460,000. This compares with a net total of £490,815,000 for 1959-60 (including the Supplementary Estimate for £15,000 presented in June 1959).

The build-up of medium bombers has continued steadily. The Vulcan 1 squadrons are complete and the last Victor 1 squadron should form early this year. During 1960-61, Vulcan 2s will be entering service. These will greatly enhance striking power and, as the build-up continues, will allow Valiant squadrons to replace Canberra squadrons assigned to SACEUR in the tactical role. The development of the Victor 2 has been delayed by the loss of the prototype last August. It will now enter service next year. The Mk 2 Vulcans and Victors will be capable of carrying both free-falling and "stand-off" nuclear weapons.

The Command has further improved its ability to reach a very high state of readiness at short notice.

During the next few months the deployment of Thor will be complete. This achievement within about 2½ years from the signing of the agreement with the United States is a remarkable co-operative effort. Development of Blue Streak continues. Good progress is also being maintained with the TSR.2. Because of its designed take-off performance, range, speed and comprehensive equipment this promises to be an outstanding strike and reconnaissance aircraft in Europe and elsewhere.

In Fighter Command, the Lightning has started service trials. Squadrons will begin to re-equip this year. Javelins of later marks with Firestreak are already in squadron service. The Lightning aircraft and some of the Javelins are being fitted for in-flight refuelling.

Experience with the operational deployment of Bloodhound during the course of the year, and in trials, has confirmed the weapon's capabilities. More operational stations will come into service in 1960-61.

Lightning

The versatility and flexibility of Coastal Command have been demonstrated. Shackleton squadrons operated from bases in the United States, Canada, Malta and Gibraltar as well as in the United Kingdom on maritime exercises.

In addition to the maritime activities of the Command, Shackletons were detached to the Arabian Peninsula, Gan and the Caribbean. Goodwill visits and demonstration flights to the Caribbean now form a regular feature of the Command's training programme. Shackletons carried out extensive sea search and meteorological reconnaissance flights in connection with the army's guided missile trials programme. Shackletons and helicopters were also involved in many search and rescue incidents. Hastings continued their daily meteorological flights over the Atlantic.

During the year Transport Command's strategic transport force will complete equipping with Britannias. It will then be equipped entirely with Britannias and Comets, which are to be supplemented in due course by the Britannic freighter. For the medium-range tactical role an order has been placed for the military version of the Argosy (AW.660).

More Whirlwinds are being ordered to provide increased tactical transport support for the Army in the field, and a more advanced helicopter is also to be developed for this purpose. In January 1960 a new Group—No 38—was formed within Transport Command to plan and control tactical and short-range transport operations and training in close liaison with the Army.

In Germany, re-equipment of AW fighter squadrons with Javelins is practically complete. It has been decided to defer the withdrawal of certain fighter squadrons from the Second Allied Tactical Air Force. It is planned to withdraw the Swift from service in the fighter/reconnaissance role and to replace it with a fighter/reconnaissance version of the Hunter.

The Canberra force in the Middle East is re-equipping with later marks. These provide a vital contribution to the Central Treaty Organization and have taken part in numerous exercises designed to assist CENTO countries to withstand air attack.

In the Arabian Peninsula, local operations in Oman concluded in February 1959, and the main tasks of the Royal Air Force have been to police the frontiers of the Aden Protectorate and to operate in the Persian Gulf area. Venom squadrons are being re-equipped with a fighter/ground attack version of the Hunter and work is in progress at the airfields of Khormaksar, Masirah and Sharjah to improve their capacity for modern aircraft.

*HM Stationery Office. Price 11s 6d.

Bloodhound

The Royal Rhodesian Air Force has continued to provide a valuable source of reinforcement for the Arabian Peninsula at short notice. In Kenya additional Beverleys and Twin Pioneers have recently been established to support the brigade group located there as a mobile theatre reserve.

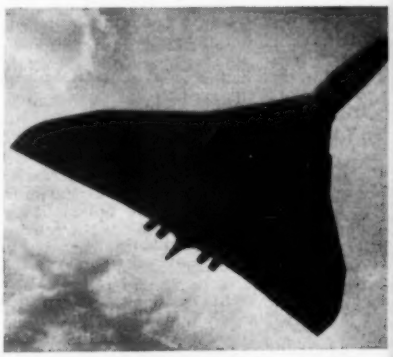
Close co-operation continues to be maintained between the Royal Air Force, the Royal Australian Air Force and the Royal New Zealand Air Force in the Far East. In Malaya, now that the back of the terrorist organization has been broken, the scale of RAF operations has been greatly reduced, although transport support continues at a high level.

The strength of the RAF on April 1, 1960, including women and boys, but excluding local forces abroad and civilians, will be 164,300 compared with 173,200 on April 1, 1959. By April 1, 1961, the strength is expected to be 163,000.

Numbers of Jet Provosts are now in use for basic flying training and more are being delivered. Conversion training for Lightning pilots is in progress in preparation for the formation of the first Lightning squadrons during 1960.

The RAF continues to provide training facilities for Commonwealth and foreign countries; nearly 200 pilots and navigators from 15 different countries were trained in the United Kingdom during 1959. Further assistance has been provided by special missions and training teams overseas, notably in Jordan and the Lebanon. In Germany 100 RAF pilots are assisting in the training of the German Air Force.

The aircraft accident rate continues to show a steady and encouraging decrease. The fatal accident rate is even lower than last year, when it was the lowest ever recorded. In fact, the fatal accident rate per hour flown by all aircraft is now only one-third of what it was ten years ago; for jet aircraft alone (which now account for about half of all flying) it is rather less than one-sixth.



At the RAF College, Cranwell, the syllabus is being broadened and extended and for the first time it will be possible for cadets to specialize, on university lines, in subjects of their choice. There will be more time for general and academic study. To make room for this some flying training will be postponed to a postgraduate phase. Minimum entry standards to the College will be raised with effect from September of next year.

Victor B.2 (above) and Vulcan B.2

Points that emerged from a press conference included these:—

There would be about half as many Valiants in SACEUR as there were Canberras now; Handley Page had made "certain assumptions" (which the Air Minister thought "very reasonable") about the loss of the Victor B.2 last year from Boscombe Down, and if we did not "fish up any more" the assumptions seemed to be right; the stand-off bomb would go into service "in the near future"; an order for the TSR.2 would be placed shortly—also one for the Gnat Trainer; the RAF were interested in the Hawker P.1127 as a long-term project; the first RAF Lightnings will be based at Waterbeach; and the missile warning system would be ready within two or three years.

Commenting on the fact that there was no mention of the Rotodyne, the Minister said, "It's better, until we are certain, not to make any mention of it."

[In the *Report on Defence* it was stated, "A contract has been placed for the development of the Rotodyne."—Ed.]

An important aspect of the Air Estimates, a full description of the new Royal Air Force career structure, is referred to on page 289 (Service Aviation) of this issue with a report of comments made on it at the press conference.

Mr Sandys' Blank Cheque

SOME CRITICAL THOUGHTS ON THE RECENT MINISTERIAL ANNOUNCEMENT

ON February 15 the remarkable Mr Sandys waved a blank cheque before the House of Commons and blandly informed the Members that he proposed to sign it in favour of the aircraft industry. Scarcely an order paper rustled in disagreement. Only Emrys Hughes (Lab., S. Ayrshire) uttered a word of criticism and that merely to complain that Scotland had not been mentioned as a beneficiary. G. R. Strauss (Lab., Vauxhall), for the Opposition, welcomed the statement.

Conceivably the process of parliamentary probing will soon begin, but so far the Minister has had nothing more than an after-lunch speech to ruffle his composure. His personal success has in fact been considerable. The aircraft industry, the Treasury, and the Commons have in turn permitted him to have his way.

Of course the triumphs to date have been limited to what he himself described as the "initial process." Ultimate proof of success can only be shown in the order books for British aircraft.

An obvious first need is for more information, especially about financial assistance. If parliamentary and public comment is to be helpful then it must be based upon some reliable figures. Of course there are difficulties, but they tend to be exaggerated.

One is the old business of security. That can cover not only a multitude of sins but many millions of pounds. When the Minister murmured that he would "show as much information as is possible in the Estimates," many must have recalled that it was the predecessor of the MoA, the old Ministry of Supply, which contrived to spend over £100,000,000 on the manufacture of the atomic bomb without identifying a penny of that amount in the Estimates. It can be argued that the development of the nuclear deterrent has itself rendered much of the accepted security procedure out of date: since each side has enough knowledge to destroy the other the case for concealing financial details is less strong. Mr Sandys might well take this opportunity to suggest to his colleagues that a small, objective and authoritative committee be appointed to look into this business of classifying information —in the expectation that an incidental result of their findings would be greater freedom to tell the taxpayer what is happening to his money.

In many ways there are more genuine difficulties when it comes to giving details about civil projects. A rival firm at home would not be slow to demand more if he thought his own contract to be less favourable than the published details of another. A competitor abroad would no doubt be equally ready to raise the hare of "unfair subsidies." Probably even more important would be the complaint of the customer who considered himself the subject of undue "recoveries."

Wanted—a Balance Sheet

It would be foolish to pretend that the problem is an easy one, but it would be equally irresponsible to accept that the present situation is satisfactory. Public money is now being placed at the disposal of private firms on a scale not known before. The Chancellor disclosed the other day that since 1951 no less than £2,311m had been disbursed in subsidies to private industry and agriculture. A part, and now a growing part, of this vast sum is to go to the aircraft industry. It would be sensible to act on the assumption that the taxpayer will not always take this for granted unless some account is rendered. And it is difficult to believe that an alert and mature Parliament will indefinitely tolerate a situation illustrated by this question and answer:—

> Mr Strauss: "How much was paid by Her Majesty's Government and the two air corporations to aircraft firms in the last financial year for research and development; and how much was repaid by such firms on sales of products resulting from development contracts?"
>
> Mr Sandys: "The bulk of the research contracts are in respect of military projects, and it would not be in accord with established practice to disclose the expenditure involved. I am informed that no payments were made for research and development by either of the two air corporations in 1958-59. During the year some £7½ millions was paid to my department in respect of sales of aircraft developed with Government assistance."

It is possible for a Member of Parliament with time, money and contacts to get further information from private sources. It is also possible, well after the money has been spent, for Members collectively, through the Select Committee on Estimates, to prise out more information. But if this new policy is going to mean, in any real sense of the word, the "partnership" between Government and industry which we all hope it to be, then ways must be found for providing more information about how much money has been invested, with whom, and on what terms.

When terms are considered there is one point, not covered in the Commons exchanges, which must be taken into account. Over what period is finance to be made available on the scale now contemplated? Mr Sandys' policy is itself a reversal of that of his predecessor Mr Jones; what guarantee is there against another reversal in another twelve months' time? The Chancellor's budgets are compiled on a twelve-month basis, but the production of an aircraft means at least a five years' programme. If industry is to plan ahead sensibly there must be some continuity of Government support. This particular industry has had experience in the past of changes in Government policy; it has therefore an interest in common with the taxpayer if it seeks a pattern of partnership which is an improvement on that of the past. Which brings me to a proposal that I first made some five years ago. Why does the Government not formalize its partnership by taking an equity-share interest in the companies it is now committed to support?

One Labour backbencher, John Diamond (Gloucester), raised the idea again last week and was promptly slapped down by the Minister. It was significant that next day the Liberal, anti-nationalizing newspaper *The Guardian* described the proposal as an "excellent investment." I might well ask—where are the better alternative ideas?

Mr Sandys assured the House that there would be "adequate Government control." Has he any new methods of ensuring this? Does he still rely only on the inspectors and accountants—"the fellows," as Lord Hives once described them in evidence to a select committee, "who go around and investigate us." The committee on that occasion did not express complete confidence that "the fellows" could get at all the information which they needed, and a Ministerial observation post in the board-room might well help to build up the confidence that is necessary between a large investor and the company in which the investment is placed.

Moreover, an investment placed on these terms might also help to satisfy doubts expressed about the return to the State on monies advanced. The Minister explained that "suitable arrangements will be made for the Government to participate in the proceeds from sales." There was no indication that a new formula had been evolved which will be better than the old. And as *The Guardian* again moderately phrased it, "the past experience in seeking to recover the costs of assistance given for aircraft development has been far from happy."

A Changed Situation

Of course the equity-share idea is not without its complications, which is no doubt one reason why Mr Strauss did not see fit to advance it last week as Opposition policy. For one thing a company cannot be expected to fulfil an order and accept in return only a bid for a number of share certificates. Capital payments are no substitute for income earned; nevertheless, much of the assistance promised looks very much like a capital provision. Moreover, we should all do well to recognize that the aircraft industry is now entering an entirely new phase. The old answers no longer fit the new situation. An objective and specialist appraisal of the equity-share proposal might well show that it goes some way to meet some of the doubts expressed.

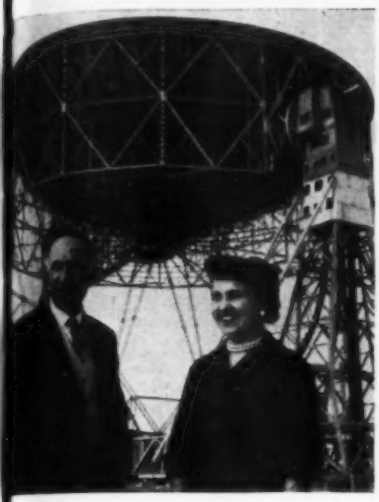
Sir Arthur Harvey raised a different issue in the Commons. He asked, "Will my right hon. Friend confirm that companies which are not taking part in this rationalization will not be excluded if they have something new and different from other groups?" The Minister replied that it was his hope that "some of the firms not so far included in the new groups will still join . . . but we do not exclude the possibility of placing orders outside the groups for specialist requirements . . . or it might be social or public policy to place a particular order."

One is left wondering a little about this line of thought. In this big, new, neat and tidy set-up, will there be scope for the unconventional and the nonconformist? What happens to the man who has a contribution to make but whose "face does not fit" either of the two groups within his field? I recall the comment of Sir Frederick Handley Page when I asked him about rationalization: "The Conservatives spell the word with an 'r' and the Socialists begin it with an 'n.' In practice it amounts to the same thing." I think I understand what he meant.

No doubt there will be many more questions asked in Parliament. The taxpayers' representatives will probably badger the Minister until a clearer picture is produced showing the present relationship between State and aircraft industry. But it would be quite wrong to imply that down in the factories, where the real work is done, everything is poised motionless whilst Westminster continues the debate. By all accounts things are working out much more smoothly than might have been expected. The fact is that Britain has some of her greatest characters in the aircraft industry and there is now no reason why their finest achievements should not still lie before them.

FRANK BESWICK

Missiles and Spaceflight



Visiting the Jodrell Bank experimental station of Manchester University on February 19, Prof Alla Masevich paused in front of the 250ft steerable radio telescope with her host, Prof A. C. B. Lovell, director of the station. Mrs Masevich expressed thanks for Jodrell's help in tracking sputniks and Soviet space probes, interest in the facilities of the US team from Space Technology Laboratories, and envy at the "big dish"

US INTEREST IN SKYLARK

A "multilateral" sounding-rocket programme involving the USA, Australia and Britain, was forecast in a speech in Washington on February 16 by Arnold W. Frutkin, Director of the Office of International Programs of the National Aeronautics and Space Administration. Mr Frutkin said "The US hopes to purchase British Skylark rockets for which the Australian launching range at Woomera is fitted and to instrument them for the necessary experiments, the rockets themselves to be launched by the Australians." (A review article on Skylark begins on page 269.)

Interest in co-operative projects, Mr Frutkin said, had been expressed formally and informally to NASA by scientists in many countries. "For example, the Australians have proposed that they prepare instrumentation to study very low-frequency emissions above the ionosphere in the regions of the lines of magnetic force. The instrumentation would be launched in rockets or satellites by the United States."

Also mentioned by Mr Frutkin was the NASA plan to establish new Minitrack satellite-tracking stations in the United Kingdom and Canada. Details of the proposed British Minitrack station, at Winkfield, were given exclusively in *Flight* last week.

TEN-YEAR PLAN FOR SPACE

The launching schedule planned by the US National Aeronautics and Space Administration for the next decade was outlined by Richard E. Horner, NASA associate administrator, in Washington recently. The numbers of major rocket vehicles involved are given in the table below:—

Vehicle	1960 (Last half)	1961 (Quarters)				Fiscal Years								Total
						62	63	64	65	66	67	68	69	
Redstone ...	1	2	3	2	–	–	–	–	–	–	—	—	—	8
Atlas	1	2	1	2	1	6	1	–	–	–	—	—	—	14
Juno 2 ...	1	1	3	–	–	–*	–*	–	–	–	—	—	—	5
Thor-Able ...	2	–	–	–	–	–*	–*	–	–	–	—	—	—	2
Atlas-Able ...	1	1	–	–	–	–	–	–	–	–	—	—	—	2
Scout	4	2	–	2	–	6	6	6	6	6	6	6	6	56
Thor-Delta ...	2	1	2	1	1	5	–	–	–	–	—	—	—	12
Thor-Agena B	–	–	–	–	–	1	6	6	6	6	6	6	6	43
Atlas-Agena B	–	–	–	1	–	3	4	5	6	3	12	12	12	80
Atlas-Centaur	–	–	–	–	1	5	4	5	6	9				
Saturn ...	–	–	–	–	–	2	2	3	4	4	4	4	4	27
Nova type ...	–	–	–	–	–	–	–	–	–	–	—	1	2	3
Total ...	12	29				28	23	25	28	28	28	29	30	260

In fiscal year 1962 and beyond, Mr Horner commented, the present variety of first-stage launch vehicle types would be reduced to one solid-propellant rocket (Scout) and three liquid-propellant vehicles—Thor, Atlas and Saturn. He continued: "This number might very well be reduced further by eliminating Thor vehicles earlier than is indicated in this chart. The Agena B and the Centaur will become our utility second stages until larger high-energy upper stages come into use on the Saturn in fiscal year 1965 and beyond. . . . Beyond the capability of the Saturn series of vehicles, we have provided for introduction of a vehicle, the Nova, with four to six times the first-stage thrust based upon the 1½ million pound F-1 engine currently under development. We foresee the beginning of development testing on such a vehicle in 1968." (Photograph of engine mock-up below.)

Discussing the missions to be attempted by these boosters, the speaker said that in the current year the first orbital experiments in both meteorology and communications would be made, and also the first sub-orbital flight of an astronaut, "boosted more than 100 miles into space with a Redstone vehicle." During 1961 "a sophisticated lunar impact vehicle" would be launched, Centaur flight tests would begin, and the first orbital flight in Project Mercury would occur.

"From there we go through the ten-year period with a comprehensive program of exploration of the Moon and the near planets and developing the Saturn launch vehicle to provide necessary information and capability for the beginning of manned circumlunar flight in the latter part of the decade. It appears to be clear, from a careful analysis of launch vehicle requirements as we now understand them, and information yet to be developed that a manned landing on the Moon will fall . . . beyond 1970."

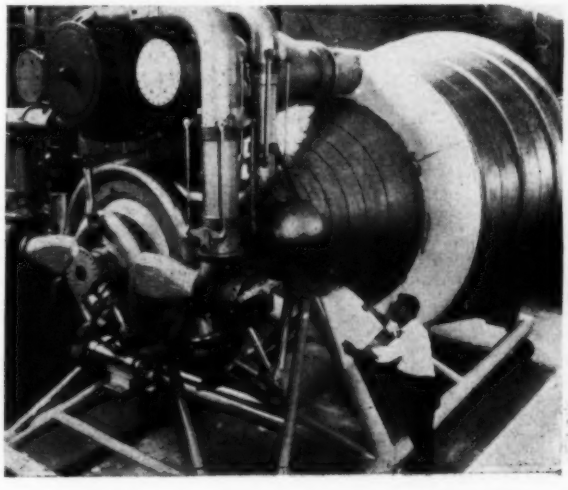
SPACE-TALK IN THE HOUSE

In an adjournment debate in the House of Commons on February 22, the Parliamentary Secretary to the Ministry of Aviation, Geoffrey Rippon, said that a space-stabilized satellite weighing 1,000-2,000lb "could, if wished," be placed in a 200-300 mile near-circular orbit by a combination of Blue Streak, Black Knight and "a small additional rocket stage" by the mid-1960s. It would provide a platform for astronomical observation. A full report of this debate will appear in next week's issue.

Answering questions on space research in the House on February 15, the Minister of Aviation, Duncan Sandys, said that plans for Anglo-American cooperation, already announced, were "developing satisfactorily"; vertical soundings and experiments in the ionosphere were being carried out in cooperation with Canada and Australia; and "All Commonweath countries have been invited to give us their suggestions on all aspects of the programme and they are being kept fully informed of progress."

After reaffirming that "we are going ahead with design studies of the modifications which would be needed to make it possible for Blue Streak and Black Knight to be used for launching satellites ourselves," Mr Sandys said "Meanwhile we shall make any use we can of test firings to obtain further information about conditions in the upper atmosphere." [One scientific experiment which had "thumbed a ride" in this way in a Black Knight on October 30 last was described earlier this month at the Royal Society: this was the measurement of cosmic-ray intensity, using a single Geiger counter, by the Physics Department of Imperial College.]

A final question came from Woodrow Wyatt: "Does the Minister realize that many scientists and engineers of a practical nature, as distinct from those members of the Royal Society who advise him, are extremely worried that, if we do not soon begin to spend something of the order of £20m a year in space research, we will be left behind in this branch of technology by Russia and America, with consequent suffering to our exports in the engineering and scientific field? Will the Government stop fiddling about with sums of £100,000 or £200,000 and get on



Rocket engineers will be particularly intrigued by this full-scale mock-up of the Rocketdyne F-1, rated at 1.5m lb thrust. It reveals the definitive turbopump, on the axis of the chamber. This engine was illustrated by a drawing on page 201 of our issue of February 12

Missiles and Spaceflight . . .

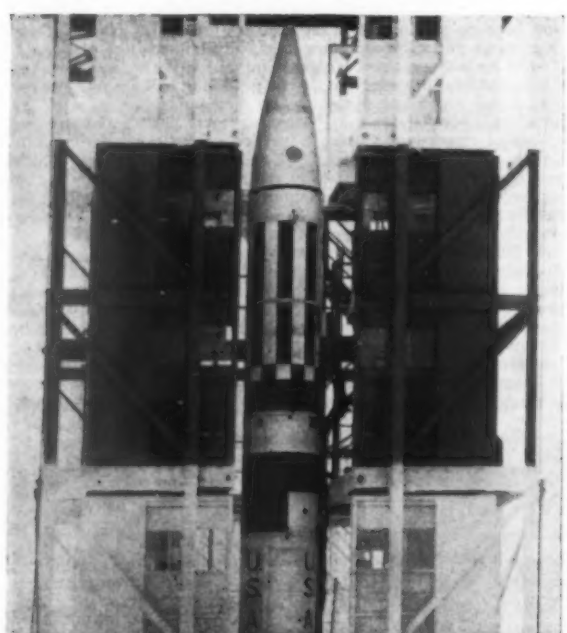
with it?" The Minister replied: "The expenditure in the first case will be modest, but as the programme develops I have no doubt that it will increase. I did not like the hon Member's disparaging remarks about the Royal Society."

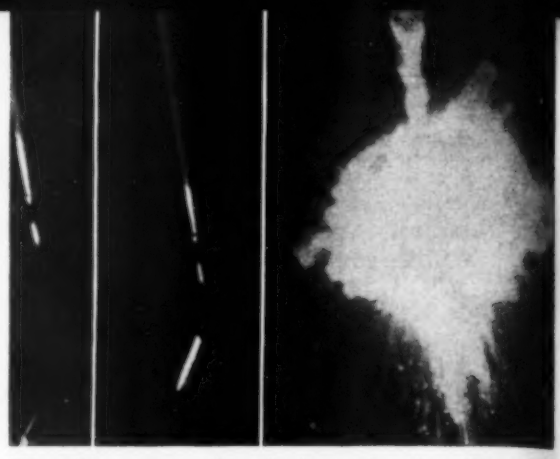
MISSILE-WARNING SITE SELECTED

In our issue of January 29 we published an account of the USAF system of ballistic-missile early warning (BMEWS), and noted that such an installation was likely to be erected on the moor at Fylingdales, Yorks. An official announcement to this effect was made by the Air Minister, George Ward, on February 17. He said:

"The station will be commanded and operated by the RAF. The information it obtains will be available simultaneously to operations centres in the UK and USA. SACEUR will receive the warning generated by the system; and the UK will also have access to information provided by the other stations [one in Greenland and one in Alaska.—Ed.]. The US will provide and install the radars . . . and pay for the communications required to link the station to the rest of the system. The UK will provide the land, erect the buildings and provide communications required to link the station with our own authorities. For the first five years . . . technical spares will be provided by the US Government, and on-site maintenance will be borne by the UK . . . capital cost to this country is expected to be about £8m, and to the US about £35m." The installation will take two to three years to complete.

Answering questions, the Minister said that the station would require four square miles of land, would be manned by about 50 officers and airmen, some of whom would be from the USAF, and that it was hoped to achieve "a good deal more" than four minutes' warning time—"enough to get a substantial part of the bomber force into the air." The Minister did not answer one Member who asked whether the BMEWS will "look one way, or . . . westwards against any possible Atlantic submarine attack." The following day he said that the station could detect rockets "on any trajectory"; but the installation does in fact "look one way," as is obvious from the description in our January 29 issue.





This striking sequence shows the interception of an Honest John artillery rocket by a Raytheon Hawk semi-active homing weapon. Both are US Army missiles. The strike was achieved at White Sands Missile Range, New Mexico, at an altitude of some 8,000ft and slant range of 10 miles, on January 29

PERSHING ON VIEW

During his visit to the Air Force Missile Test Center at Cape Canaveral on February 10 President Eisenhower was shown a Pershing on its pad, and was briefed on its expected performance. Pershing, a selective-range ballistic missile under development for the US Army by Martin's Orlando division, had not previously been seen in public.

Although the Army Ballistic Missile Agency have always maintained an unbroken series of projects for strategic missiles, Pershing's development could not be started until early last year, when the Secretary of Defense once more permitted the Army to sponsor missiles with a range greater than 200 miles. As we noted in our Missiles 1959 issue last November 6, Pershing marks a departure from the traditional army "arsenal" concept in that its development has been entrusted to private hands from the beginning.

Although the Secretary of Defense has allowed the Army to exceed 200 miles' range he is enforcing a weight limit of 10,000lb (apparently dictated by political motives). Within this limit Pershing is expected to have a range of 500 miles with a nominal warhead, and possibly 700 miles with later propellants.

Martin have produced an attractive two-stage weapon, the first stage having a large solid-propellant engine and controllable delta fins. At the appropriate point stage-separation takes place and the solid charge of the second stage fires. (There has been much argument recently over whether the reduced weight of titanium motor casings justifies their additional cost.) Near the required velocity the upper part of the motor chamber is vented by the detonation of explosive plugs which seal four ports, and the resulting sudden fall in interior pressure cuts off combustion precisely.

The inertial guidance system is by Bendix Eclipse-Pioneer, and any of a variety of nuclear warheads may be carried beneath the Jupiter-derived nosecone. Just visible in the photograph is the Thompson Products transporter/erector, which comprises a rigid chassis and upper manacle ring reminiscent of that of Thor. The vehicle is designed for cross-country performance. A note on Pershing's development was given on this page on February 5.

A team from Tokyo University plans to test-fire a two-stage rocket weighing 1-2 tons from Michkawa Beach, Akito Prefecture, between March 27 and 29.

A report from New Delhi claims that a number of Indian technicians are at present in Britain learning to operate the Bloodhound weapon system. The report suggests that Bloodhounds will be purchased by the Indian Government.

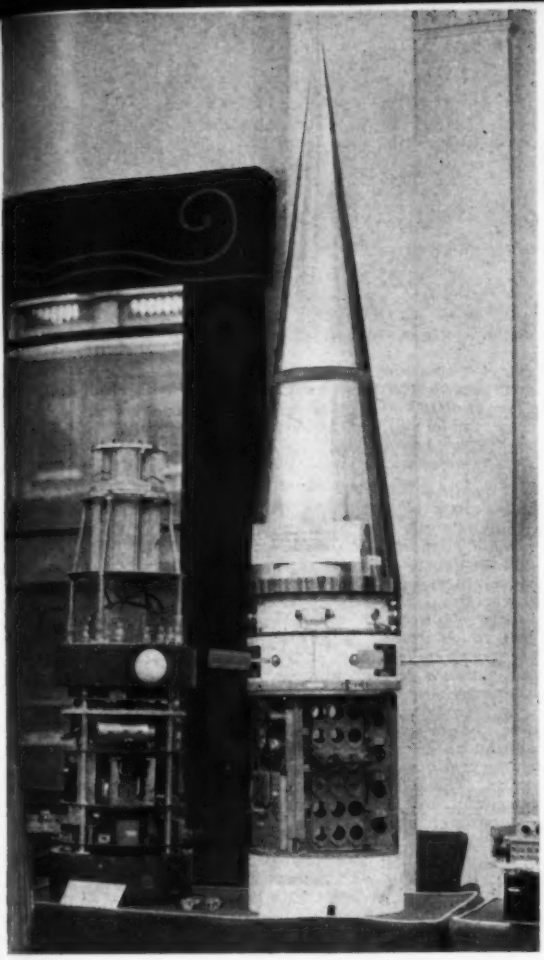
A new picture-relay technique which will, it is claimed, make possible the transmission of photographs from aircraft or satellites to ground stations without loss of detail, has been developed by CBS Laboratories, a division of the Columbia Broadcasting System.

Norway will probably launch sounding rockets to investigate the Aurora Borealis as the first stage of her space-research programme, according to Dr Finn Lied, a director of the Defence Research Institute.

Nike-Ajax units of the Dutch Air Force assigned to NATO are to be stationed in Germany, near Münster, Rheine, and Hesepe-Voerden.

A new aerospace technology department has been established at Lockheed Aircraft Corporation's Georgia Division. Hypersonic ramjet aircraft, boost-glide missiles, orbital vehicles and re-entry devices are among the systems to be studied.

First photograph to be released of Pershing, the US Army's forthcoming selective-range ballistic missile. As noted in a news item above, the big solid-propellant replacement for Redstone was inspected at Cape Canaveral by President Eisenhower earlier this month



Left, the instrumentation section of Skylark No 13, not yet fired, with five-tube photometer (upper section) devised by Queen's University, Belfast, to determine altitudes of luminous night-glow layers. Visible in the Skylark on the right are the (lower) grenade bay assembly, in which 18 grenades are carried; and the insulated nosecone used in the Birmingham electron-density experiment. The base ring of each round would be bolted to the forward end of the Raven motor

"Flight" photograph

Missiles and Spaceflight . . .

SKYLARK PROGRAMME

THE planning of experiments for the first Anglo-American satellite, and US interest in using Skylark sounding rockets in an international project, have recently focussed attention on the British Skylark programme. This article, illustrated with photographs of Skylark equipment exhibited at last month's COSPAR Symposium in Nice, describes the vehicle, its history and its test programme.

THE value and practicability of a programme of upper-atmosphere research being undertaken by Britain was first discussed at a meeting of the Gassiot Committee of the Royal Society as far back as October 1953. These discussions followed a conference held at Oxford during the previous summer, when a number of leading American rocket technicians had given lectures on the techniques and results of US experiments. Discussions were then held between representatives of the committee and the Director of RAE, which were followed by joint representations to the Treasury, as a result of which a financial grant was obtained.

The Royal Aircraft Establishment undertook to develop rocket vehicles suitable for carrying out the desired experiments. The first of these is the Skylark, designed to carry a scientific payload of 100-150lb to altitudes over 100 miles. It is basically a very simple vehicle, cylindrical in shape with a conical nose, 25ft long and 17.4in in diameter. It is dart-stabilized by three large fixed fins and is uncontrolled in flight. Power is by a Raven solid-propellant motor giving a thrust of 12,000lb for about 30sec, the exact period being determined by the shape of the charge.

The nose section is made in two parts; the 65in long cone and a 30in parallel bay. The cone provides 2.7 cu ft of payload space and the bay a further 2.3 cu ft. Both cone and bay can be pressurized independently.

Information obtained in the rocket is transmitted to the ground receiving stations by a telemetry sender. The standard transmitter uses an AM/FM system on 465Mc/s and is capable of giving 100 accurate readings per second for up to 24 instruments. Electrical power is provided by special lightweight batteries; these drive rotary convertors where necessary.

By agreement with the Australian Department of Supply and with the co-operation of the Weapons Research Establishment authorities the Skylarks are launched from Woomera in South Australia. A special 100ft cradle, supported on gimbals in a tripod base, was developed for launching them.

Both radio and optical instruments are used to track the vehicles and so obtain trajectory information. For the radio tracking, a microwave beacon is carried in the rocket, and two widely separated ground receivers lock-on to the signal and provide a continuous record of the relative azimuths and elevations.

The radio Doppler system is also used to give velocity and position information. A ground transmitter sends a continuous wave signal to the rocket; a transponder in the rocket doubles the received signal and re-broadcasts it to the ground. A ground receiver compares this received frequency with the original transmission suitably doubled and obtains a Doppler beat frequency which is a measure of the radial velocity of the rocket with respect to the receiver. If three receiving stations are employed the rocket's velocity in space may be computed, and its position can be determined with accuracy after summing the Doppler beats along each radial line.

For optical tracking, the rocket is photographed in flight by high-speed cameras and by kine-theodolites, the former giving a record of vehicle behaviour during the launching phase. Several widely spaced kine-theodolites are used, each of which photographs both the rocket and a set of elevation and azimuth dials as well, so that the rocket position can be calculated using triangulation methods.

By combining the results of these three systems, graphs of the rocket's trajectory, speed and acceleration can be plotted, and from these can be obtained aerodynamic information about the flight behaviour of the vehicle up to its maximum speed of five or six times the speed of sound.

In fact the rocket does more than describe a trajectory. It rolls, pitches and yaws for a variety of reasons: rolling arises from slight imperfections in the structure, pitching and yawing may be set up by the varying winds encountered, and these motions may develop and become quite large as the rocket leaves the effective atmosphere, actually causing it to tumble.

To follow these additional motions both in the atmosphere and above its effective limit, gyroscopes and accelerometers are carried inside the rocket; these instruments measure the changes in orientation and the forces causing them, passing the measurements in the form of changes of voltage or inductance to the telemetry sender in the rocket which transmits the information to the ground. There the results are extracted, displayed and photographed for careful analysis back in the laboratory.

The Skylark was Britain's first venture into the realm of research rockets, and six rounds were reserved for proving trials and to enable missile know-how to be obtained before the actual scientific programme commenced. The first vehicle was fired on February 14, 1957. In this no attempt was made to achieve maximum height and, in fact, the launching cradle was depressed as far as possible and the rocket flew a long, flat trajectory. Rounds 2 and 3 were also proving firings. These three firings proved the general performance of the vehicle and its motor, and attention was then turned to trials of equipment and instrumentation and the associated ground equipment. Skylark No 4, in addition to routine instrumentation, carried equipment for four separate experiments involving grenades, metal foil "window," a dielectric experiment and pressure gauges. Fired on November 13, 1957, it reached a peak altitude of 77 miles.

Skylark No 7 (Launch No 6), fired on April 17, 1958, to an altitude of 90 miles, was the first British contribution in this field to the International Geophysical Year. The rocket carried 18 grenades and fourteen cartridges of "window," and incorporated an insulated cone for ionospheric experiments.

Following the recommendation of the Washington Rocket and Satellite Conference to establish a special "rocket interval" during June 1958, two firings were made on the target date of June 18/19. On the first of these, Skylark No 18, the rocket engine failed—the only such failure in a total of 17 firings. The second launching, arranged within 24 hours of the failure, achieved the desired results.

Another notable success in rocket handling was the firing, on December 3, 1958, of Skylark No 11 for a special experiment. This required the rocket to be fired when the Sun was at a depression of 6°, and launching was achieved within two minutes of the

Skylark Programme . . .

optimum time. In August and September 1959 three firings were made which were unpublicized at the time. The rockets carried an electron density probe and spectrometer probes to investigate elements of the upper atmosphere.

Following a COSPAR recommendation on the value of near-simultaneous launchings of rockets with related experiments in different parts of the world, a triple Skylark firing was made during a 36hr period on November 30/December 1, 1959, close to the World Rocket Week. The first of these carried the Belfast sodium vapour experiment, and the second used the UCL grenade sound-ranging method to measure atmospheric temperature and horizontal and vertical wind speeds, and radar tracking of metal foil to give independent values of wind speeds (an Imperial College experiment). The third Skylark carried three experiments; those of UCL and IC as in the prior two firings, and the measurement of electron densities in the ionosphere by the Department of Electron Physics at Birmingham University.

Skylark rocket and instrument hardware was displayed last month at an exhibition in connection with the COSPAR symposium in Nice (and later at the Royal Society, London). For the rocket itself two attitude control systems, now being developed, were on show; one using compressed air for control about pitch, yaw and roll axes simultaneously, and the other using high-test peroxide for roll control. (The instrumented head of the rocket separates from the motor at a height of about 40 miles, after which the head coasts to its maximum altitude before falling back, and it is for this coasting period that the control systems are being developed.)

SKYLARK FIRINGS

Launch No	Date	Remarks
	1957	
1 (1)	Feb 14	First proving firing, flat trajectory launch, no observation made
2 (2)	May 22	Test firing
3 (3)	July 23	Test firing
4 (4)	Nov 13	Proving firing, but instrumentation and grenades fitted (77 miles height)
	1958	
5 (6)	April 2	Test firing
6 (7)	April 17	First IGY and Gassiot firing, grenades and foil ejected at intervals (90 miles)
7 (5)	May 20	Test firing, incorporated airglow experiment (94 miles)
8 (18)	June 18	Special IGY night firing, engine failure
9 (9)	June 19	Special IGY night firing, dielectric experiment (104 miles)
10 (8)	Sept 19	Fourth Gassiot firing, instrumentation failure (97 miles)
11 (11)	Dec 3	Fifth Gassiot firing, carried sodium experiment (75 miles)
	1959	
12	Aug 19	Electron density probe
13	Sept 17	Spectrometer probes
14	Sept 24	Spectrometer probes
15	Nov 30–	Sodium vapour experiment
16	Dec 1	Temperatures and winds
17		Temperatures, winds, electron densities

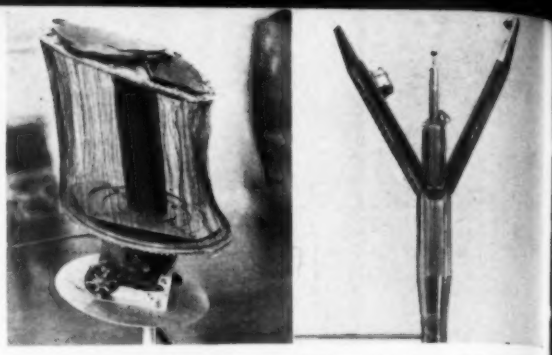
Note: Figures in parentheses indicate vehicle number where known.

During its fall, the head approaches terminal velocity of about 260ft/sec at 20,000ft, and the parachute recovery system, when carried, is usually brought into use at just under 15,000ft. At this height an altitude switch completes an electrical circuit which begins the sequence of deploying the 6ft diameter stabilizing parachute and the 20ft main parachute, designed to slow the descent to about 26ft/sec.

The rocket-grenade method (UCL and RAE) is used to measure the speed of sound at heights up to 60 miles, in order to determine atmospheric temperature and wind velocities. Eighteen grenades are carried, each containing a one-kilogram explosive charge, and these are fired from the rocket at regular intervals from 20 to 80 miles altitude, exploding at a distance of about 100ft from the rocket's path. Ground equipment is located along two perpendicular 20-mile baselines: the explosions are photographed and their positions determined to a 30ft accuracy; photoelectric flash detectors record the instant of detonation (rocket-borne flash detectors are also used, together with a telemetry link) and in daylight are linked to the ballistic cameras; and an array of sensitive hot-wire microphones tuned to 15c/s records the time of arrival of the sounds of the explosions.

An after-glow lasting for several minutes was produced by a grenade exploded at a height of about 80 miles. Repeated photographs of this glow (believed to be produced by the reaction of atomic oxygen with explosion products such as nitric oxide) enabled a further estimate of wind velocity to be obtained, and the region over which this method can be used is now being investigated. Another wind-measurement technique is by radar tracking of resonant dipoles ("window"): the cartridges, each containing about 120,000 strips of window, are ejected at two points during the ascent of the rocket, and the resulting clouds of window are tracked by ground radars.

For certain experiments, the Skylark nosecone is split in two



Left, the measuring head of a Birmingham University wide-aperture mass spectrometer recovered after free fall without parachute from a height of 100 miles following a Skylark mission. Right, a Langmuir probe used for measuring ionospheric ion and electron densities (University College, London): the small spherical electrode is carried on a 5ft spike mounted on the Skylark nose "Flight" photograph

halves along its length (by a small explosive charge) and jettisoned. Equipment for one such experiment, visible in the left-hand Skylark in the heading picture on the previous page, is the five-unit photometer devised by Queen's University, Belfast, to measure the altitudes of the luminous night-glow layers through which the rocket is fired. This incorporates an optical section of five tubes, each containing a narrow-band interference filter and a lens which images the sky on a photocathode; and a detector section whose five tubes each contain an 11-stage photomultiplier and a two-valve DC amplifier. Between these two sections is a rotating shutter.

In Birmingham University's electron-density experiment, however, the nosecone itself plays an important part. The forward portion of the nosecone (above the dark strip in the photograph on the previous page) is in fact insulated from the remainder of the rocket. The capacitor so formed becomes part of a 5Mc/s oscillator circuit, and ionospheric electron densities can be obtained by observing changes in the oscillator's resonant frequency.

Another ingenious Birmingham technique employs a wide-aperture (1,000 sq cm) mass spectrometer. The measuring head of this instrument, with its associated part of the electronic circuit, is ejected from the rocket on a long cable as soon as the vehicle has passed above the major atmospheric drag region—so obtaining measurements remote from possible gas contamination from the pressurized sections of the rocket or from the hot motor shell. The measuring head (a recovered example is illustrated above) consists of a cylindrical cage having closed ends and a fine outer grid of wires. In operation, ions which diffuse through this outer cylindrical grid are accelerated by a known DC voltage towards an electrostatically screened collecting-rod electrode at the axis of the cage. Information on ionic masses, which are proportional to the transit times of ions between outer grid and the collector, is telemetred to the ground station and there de-coded.

SKYLARK EXPERIMENTAL PROGRAMME

Study of winds, temperatures and densities	
Grenade method and falling sphere experiment	UCL
Radar-reflecting foil	IC
Sodium cloud (temperatures)	QU
Sodium cloud (winds)	QU and UCL
Pressure gauges	RAE
Study of ionosphere	
Dielectric experiment and ion cage	BU
Langmuir, sporadic-E and mass-spectrometer probes	UCL
Radio Doppler and radio pulse	UCW and RAE
Radiation experiments	
Photometry of green line and OH bands	QU
Lyman-alpha ionization chamber	UCL
X-ray counters and emulsion detectors	UCL
Other experiments	
Micrometeor microphones	QU
Proton precession magnetometers	IC

Establishments indicated by initials are University College, London; Imperial College, London; Queen's University, Belfast; Royal Aircraft Establishment; Birmingham University and University College of Wales.

The right-hand photograph above shows a Skylark probe devised by University College, London, to obtain information on the charge densities in the ionosphere by studying the voltage-current characteristic of a small electrode. The spherical electrode is carried on a 5ft spike ahead of the rocket nose, where the atmosphere is relatively undisturbed, and is protected during flight through the denser part of the atmosphere by a steel case. A simpler version of this experiment is designed to study sporadic-E ionization and employs a flush electrode in the rocket skin.

Among other experiments and equipment which have been devised for Skylark are: the monitoring of the emission of ultra-violet light and X-rays by the Sun during ionospheric experiments (by means of ionization chambers and photographic detectors at present; by proportional X-ray counters and pulse height analysers in the near future); a transistorized micrometeorite detector; and a two-coil probe-mounted proton precession magnetometer.

SELECTING PILOTS FOR THE CIVIL COLLEGE

Short-list Problems: Should the Clubs Provide Pre-entry Training?

By PHILIP CLEIFE

DURING service with the Royal Air Force the writer acquired specialist experience of the problems of flying training when in command of the Training Research Squadron of the Empire Flying School. In the course of this duty he was concerned with special investigations and controlled experiments in connection with training-research projects, among which were the subjects of pilot selection and pilot assessment during basic training. He emphasizes that the views expressed are his own and are not put forward on behalf of any organization or operator.

NEXT September there will occur an event which history may well record as a milestone in the progress of flying training. About seventy young men will be filling up their arrival reports at the new College of Air Training [see page 573, *Flight*, November 20, 1959], where they will enjoy the distinction of becoming the first students to take the two-year course which is to be sponsored by the airline corporations, the Ministry of Aviation and the Ministry of Education. This State-subsidized scheme is estimated to cost between £4,500 and £5,000 for each pilot trained.

The course will essentially be of university character. In addition to the mastery of aircraft operation, air navigation and engineering, the students will have to acquire a comprehensive understanding of the whole business of air transport, including administration, economics, commercial planning and international relationships. On graduation they will emerge trained to the highest standards for the parts they will have to play as pilots and commanders in international aviation.

The prospect is an exciting one, but our enthusiasm must be tempered by the thought of the difficulties which must inevitably accompany the introduction of the plan. One of these—and it must already be engaging the very serious attention of the sponsors—is the problem of making the final selection of the candidates who will be chosen for this expensive training.

The Problem. It is a fair assumption that selection will have to be made from a large number of applicants. As the scheme becomes more firmly established, this number will probably increase—it may run into thousands a year. Yet the estimated annual requirement for pilots has been quoted as 75 to 100.

There should be little difficulty with the processes of *initial* selection, which will not differ materially from those employed in other industrial and military spheres, and which will be carried out in several stages of screening. After that there will remain a number—possibly a large number—of keen young men of the right age who are of high educational standard, physically fit, and between whom there is apparently little or nothing to choose. From these must be selected the few who will be earmarked for flying training; and they must possess exceptional qualifications.

Now it is a known fact, incontestably established during nearly half a century of flying training, that aptitude to fly and command an aeroplane is one of the most difficult of all human accomplishments to predict on the ground. The complex combination of personal qualities needed is such that there is no simple yardstick by which they can be measured during an interview or test. It is not, unfortunately, just a straightforward question of assessing manual dexterity, co-ordination, or speed of reactions. These can be measured by machines, but the results give us only a part of the picture. All that we know for certain is that aptitude for piloting an aeroplane is an ingredient of character. Those who possess it in good measure are "naturals"—they will learn quicker, they will be more likely to react correctly to any given situation, and they will be safer. They will, in fact, "belong to the air."

There is no significant correlation between this aptitude and those other personal qualities which can be assessed on the ground. In any batch of pupils selected after interview and examination to as nearly a uniformly high standard as possible, a few will be discovered during training to be exceptional pilots; a larger number will range from fair average to indifferent; and a few will be found so completely lacking in pilot aptitude that professional training would be a waste of time. Thus it is axiomatic that at some stage during flying training there must be wastage, and the higher the standard the greater the wastage.

Any training to be given at the new College of Air Training to students who are below the exceptionally high standard required must be regarded as costly wastage indeed. The lowest cost will be the expense of the training they receive before they are suspended. The highest could be a disastrous accident in later years, if an unsuitable student were allowed to finish the course. Thus is posed the very difficult but fascinating problem of how to select, from the numbers available, those individuals who are best fitted to become the airline captains of the future.

Wastage. A most effective way of making the best final selection is to train students in sufficient numbers to allow for wastage, and then eliminate those who are discovered to lack pilot aptitude—the greatest proportion of all wastage occurs during the early stages of training. But I submit that it would be wholly undesirable if such wastage should occur at the College, because:—

(1) The resources of a costly air college should not be wasted on early basic training anyway—an establishment which is essentially a university should not concern itself with "prep school" work.

(2) It would be hopelessly uneconomic to give such expensive training to a large number of candidates in order to pick out the exceptional pilots. Such advanced training as must be envisaged should be reserved for highly selected students who with few exceptions might be expected to finish the course.

(3) In the companionable atmosphere of a flying school, with its friendly personal relations between instructors and pupils, it is somewhat difficult to be ruthless, and the elimination of marginal students (who may be extremely enthusiastic and likeable young men) is not always achieved as easily as may be thought.

This begs the question of whether some form of pre-entry training ought not to be given to the short-listed candidates before final selection is made for entry to the College. Upon this issue pivots the whole weight of selection policy. There are many who will contend that the case for pre-entry training is overwhelming and so manifestly self-evident that argument in its favour is superfluous. *Per contra*, others disagree and claim that modern operational techniques have so changed that sheer aptitude for flying, as evident during basic training, is no longer important and that what is wanted is the right personality.

Here, then, is the crux of this tremendously interesting problem. Are we going to select our future airline captains according to their observed ability to fly, or are we going to choose them on personality? If the latter, what are going to be the criteria we shall use to assess it? Education? Intelligence? Background? Games? What, in fact, *are* the traits in the personal make-up of the candidate that we must be sure of before we accept him?

The Requirement. Let us first examine the problem and try to decide to what extent the development of high-speed, high-altitude flight has changed the pilot requirement from what it used to be. Now it is a fact that although the advance in aircraft performance during recent years has undoubtedly made greater demands upon the pilot in some respects, it has at the same time been accompanied by compensating factors such as 9,000ft runways, automatic control, and radio aids undreamt of by the average pilot of twenty-five years ago: so, in the overall picture, the requirement for pilot aptitude has not in itself changed so very much. Reaction speed, judgment, air sense, mental orientation, and the faculty of "belonging to the air" remain much as they have always been—a combination of personal qualities present in the first place and developed by training and perfected by flight experience, for which there is no substitute.

But there are two ways in which high-speed, high-altitude flight has intensified the demands upon the pilot. First, the complexities of the aircraft itself, with its ancillary systems, limitations, and operational margins, require of him a much

In the heading picture: Chipmunks of the Airways Aero Club

wider and more comprehensive technical knowledge than in the past; so, if he is to be capable of studying and using his equipment to the degree of safety which is essential, he must be of a higher educational standard than were many of his predecessors. Secondly, modern performance when considered together with the increase of air traffic densities is such that a good deal of the "artistry" of flying has become redundant. Instead there has arisen the need to operate the aircraft with an accuracy never before contemplated. More critically than ever before, the narrowing of the operational margins between success and failure necessitates far greater precision and calls for a pilot who is psychologically and technically trained to put himself in the right place at the right time. Slow thinkers, and those whose best level of intelligence is never attainable when airborne, simply will not rate.

Two empirical requirements are therefore that our selected candidate must have reached an educational standard to university entrance level at least, and that he must also possess the right flight temperament. Splendid! But how are we going to find out during an interview or test whether he has the right temperament or not? And what about pilot aptitude?

Is Flying Skill Still Necessary? Except in emergencies, the development of automatic control through electronic relays has reduced the need for physical handling by the human pilot to little more than the actions concerned with take-off and touch-down. He is relieved of the necessity of flying the aircraft manually to any great extent and remains free to monitor its performance throughout every phase of the flight. Does this mean that the possession of the right flight temperament outweighs flying skill to such an extent that if a pupil pilot appears to have the "personal" qualities his training should be continued even if he is lacking in flying skill? In other words—is flying skill necessary today?

One's immediate reaction is that it might be very dangerous to assume that the answer is negative. But let us probe a little deeper. No one wants to say that the ability to make a well-judged approach and perfect three-point landing in a Chipmunk is of any special significance *by itself*. It is just a skill. So is golf. Does the one matter more than the other? If that were all there were to it, the answer would be "no."

But we cannot turn our backs on the wealth of air training experience accumulated during the last half century and ignore the lessons we have learned. These have always shown us that the possession or otherwise of the right personal qualities becomes apparent in a pupil only during the early stages of basic training. It is then, and not until then, that we are able to discover whether he has the right temperament for the job. Every experienced flying instructor knows perfectly well that "numbness," muddled thinking, panic, lack of air sense, under-confidence or dangerous over-confidence, poor discipline and stupidity become clearly evident during the first thirty hours of training. This is because the environmental conditions of early training place the pupil under a certain stress which exposes his temperament in a way that would be impossible on the ground. Under its influence pupils behave very differently. Some are so tense that instruction is frustrated, some are quickly airsick as a result of nervous tension. Others settle down very quickly. As training progresses to the stage where they have to show a little initiative, differences in air sense, thinking power and intelligence become most marked. Some are completely baffled by simple questions to which they could easily give the correct answer on the ground; others are guilty of dangerous stupidities which they just cannot explain when they are interrogated after landing. There are very few activities which provide such a startling revelation of character as does a short course of flying instruction.

There is in fact a very close relationship between flying skill and flight temperament. This was proved in 1940, when the inception of the Commonwealth Air Training Plan brought the biggest pilot-selection problem ever known. Pupils in numbers previously unheard of were needed to supply the extensive chain of schools opened up in Australia, Canada, Rhodesia and the US. Because it is so much more difficult to select pilots than navigators or bomb-aimers, candidates were allowed to volunteer for aircrew duties only and received no undertaking as to which category they would be trained for. Over twenty elementary FTSs in the UK became grading schools, at which all aircrew volunteers undertook exactly twelve hours of flying instruction.

The grading scheme had many imperfections, because nothing like it had ever been attempted before. But because of the very large numbers involved some extremely important conclusions could be drawn from the vast amount of statistical data which was recorded. In significant numbers of cases the progress of pupil pilots right through FTSs, operational training units, heavy conversion units and even to squadrons was traced and recorded. The results proved conclusively that those who had made the best progress at their grading schools almost invariably turned out to be the best captains of aircraft. I suggest that there are no conditions applicable to civil training today which render these conclusions invalid. Performance during *ab initio* training remains what it always has been—the best criterion of the personal qualities of the pilot. Flying skill in fact, *does* matter.

Pre-entry Training. Once the value of basic training as a selection criterion is accepted, then the case for pre-entry training becomes unanswerable, and there remains only the question of where it should be done. The obvious centres are the flying clubs, who already undertake pre-entry training for the Royal Air Force in the form of flying scholarships for the ATC and CCF. In the past, criticisms have been levelled against the clubs on the grounds that their standards are not uniform. To a small extent this may still be true, but the post-war years have witnessed a remarkable progress both in efficiency and activity, which has resulted in increased flying hours and better equipment. The greatest single factor which has contributed to the raising of standards of the clubs has been the supervision by RAF examiners (formerly from Home Command and now from Flying Training Command). Their annual visits remain the only form of standardized control over the quality of the instruction, and they have been of immeasurable benefit in improving the training.

Thanks to this influence, and to the more advanced nature of the courses required for commercial pilot training, certain of the larger clubs have set themselves out to become equal to the task, and nowadays they more closely resemble orthodox flying training schools than sporting and recreational clubs. The facilities they can offer are efficient and economical and it would be absurd not to use them for reasons of prejudice.

Pilot Assessment During Basic Training. The full value of pre-entry training cannot be realized unless it can be made to yield precise and reliable indications of the pupils' progress—indications which can be added to other information to enable the selection board to make their final eliminations.

Now, it is a popular misconception that because flying instructors' assessments have been shown to be statistically unreliable there must be some serious disagreement between them in their appraisal of the flying skill and temperament of a pupil or group of pupils. This is not true. On the contrary, there is normally a striking measure of agreement between experienced instructors. Thus, if a number of them were to write out their comments on a course of pupils, there is no reason why the information so contained should not be regarded as dependable. Such a recording of opinion, however, is not an assessment but a report; and it is the lack of understanding of the difference which has been responsible for a great deal of muddled thinking on the subject.

The disadvantage of instructors' reports is that they do not present their information in a quantitative form which will readily lend itself to direct comparisons being made between a large number of pupils whom it may be necessary to place in a rank order of merit. For this it is necessary to make an assessment. Now to make an assessment calls for the fixing of a value or a rate. It can be expressed either finely (as in the case of a percentage score of marks against perfection) or coarsely (as in the grouping of subjects in a number of different categories ranging say from "exceptional" to "below average"). For assessments to be statistically reliable means that the score of value awarded by different assessors when testing the same subject must be approximately the same. In practice this does not happen because flying instructors can make different awards on a rating scale for the same performance upon the merits of which (expressed as opinion) they may entirely agree. This is simply because their marking ranges are different. Even the simple dichotomy pass/fail cannot be made reliable because it is so difficult to establish agreement upon where to put the dividing line. Reliable assessments, therefore, can be made only from accurate and purely objective observations; or, if they are to be based on opinion, by one assessor or a small group of assessors whose scales of awards have been strictly standardized.

It follows that during basic training all information upon pupils' progress must be rendered in the form of reports. Unfortunately, the records currently in use are little more than broadsheets with space for reporting in narrative form, and they leave much to be desired. Badly needed is an entirely new format which will incorporate a questionnaire of the multiple-choice type designed to reveal accurate progress information in relation to hours flown and which will be as objective as possible and obviate the need for instructors to write essays. From such information, reliable assessments can be made independently for submission to the selection board. I for one would like to see such reports used for *all* civil training to PPL standard.

Subject to this provision, the case for pre-entry training requires little further advocacy. It is hardly within the scope of this article to recommend a suitable structure for its implementation and at this stage we can only hope that the sponsors of the new College will make a realistic evaluation of its advantages—not only as the most economical process of *ab initio* training, but also as the only efficient screen for final selection.

The Independents and the New Bill

FRANK BESWICK Talks to One More Private-enterprise Operator

LAST week, in continuing his series of interviews on topical subjects, Mr Beswick presented the opinions of four well-known personalities in private-enterprise air transport—M. D. N. Wyatt, Gp Capt C. A. B. Wilcock, Eon Mekie and Maurice Curtis. Here he adds the views of a fifth—Harold Bamberg, chairman of Eagle Aviation and its associated companies. The new Bill is discussed on page 283.

Harold Bamberg

MAYBE it is not inappropriate that, after last week's review [page 232] of opinions among leaders of Britain's independent air transport services, Harold Bamberg's views should be set down separately. He and his Eagle companies have a distinctive character; and my first question was: *"You've been an independent independent, both in ideas and operations; what is your outlook now, against the background of the new Bill?"* To this Mr Bamberg replied:—

"I'm a bit of an optimist, and if you believe in air transport you naturally believe in your own future. Moreover, we are rather a strange company in that we have our two subsidiaries overseas working in close conjunction with Eagle Airways, and we are not therefore quite so dependent upon the United Kingdom Bill."

How do you see your company developing within the new scheme of things?

"It depends upon how the legislation is interpreted. Some say there is now a great future for independents, and others that there is no future at all; some think the corporations will be badly damaged and others that they won't be touched.

"The repeal of Section 24 can put the industry on an enormously better basis—but other considerations are involved. We see our future largely in terms of international scheduled flying, both passengers and freight. Trooping, charter and Inclusive Tour work don't lend themselves to planning ahead."

You intend, therefore, to change the basis of your previous operations?

"No. I wouldn't say that. People exaggerate our present charter and IT flying. We have today the largest British network of independent scheduled services in Europe. And that is no coincidence. Since the 1952 terms of reference to the ATAC we have tried desperately to get a decent scheduled pattern. We have made mistakes, but we now have 12 routes in Europe; they broke-even in 1959 and should show a profit in 1960. It has taken us a matter of six years, but it has been worth-while to build this basis."

How will this pattern, and its development, fit in with the ideas of BEA?

"Like others, I accept that the corporation's basic interests must be protected; they are a vital part of British aviation. But there is still scope for parallel services and the new board has the job of deciding where they will be."

On what principles do you consider the board should make these decisions—apart, of course, from considerations of technical fitness of the applicant?

"The first important question is whether the existing operator is getting an adequate share of the traffic for Britain. Then an applicant may be capable of new specialized operations in the future but wants a conventional basis. On a cabotage route, where there is more flexibility, an efficient operator who can offer lower fares should be allowed to do so. The low-fare idea was a bogy when we first offered it, but today everybody is jumping on the bandwagon. We now need to evolve a new method of measuring airline efficiency; I think a formula can be found which would show whether a low fare is made possible by genuine efficiency —or by subsidy or by other factors. The last thing we must do is to protect an existing operator who has built-in unnecessary high costs."

Do you think the board's policy should be to steer, through licensing, one particular operator into a particular sphere of operations?

"A good idea—into one geographical theatre for example. Specialization means a better job. It would be indigestible for every operator to have to do a bit of everything. I would qualify that a little, probably, but broadly I accept it."

And what would be your theatre of operations?

"We have Europe, of course. Our Atlantic service through Bermuda ought also to be put on a proper basis, with other offshoots to the North Atlantic coast. And then there is the Caribbean—that is an interesting area, and it has plenty of potential."

If there is to be rationalization of operations how far should this extend to present companies?

"There is scope for three or even four companies, and we have the basis for being one of them."

Does this mean more mergers?

"Maybe, but there are two ways of getting the fitter, stronger companies which the Minister wants. In our case we can either merge or else stay separate and get a pretty hefty transfusion of finance to enable us to meet the necessary development. Quite frankly, to get the type of operation we have had, with a welter of international agreements, we have a situation in which large-scale finance is necessary.

"But although we choose to stay separate we do not close our minds to such ideas as interchange of aircraft and crews, possibly common handling, exchange of sales facilities, and a pooling of spares."

What does this sort of future mean in terms of new equipment?

"We are now making a rational evaluation. Like others, we want to fly British—but it does limit one's thinking. Our conception is that for long-haul routes a pure-jet operation is the cheapest. We expect to reach a definite decision about the type we need within the next two or three weeks."

I recall that you really made your start with cheaply bought secondhand aircraft like the Halton and the Viking. Do you still feel that there is a role for such equipment on the very-low-fare routes?

"The original VLF pattern goes by the board with the new Bill; but for the economy-class pattern, as we see it, we shall require the most efficient pure-jet aircraft. The cheap secondhand aeroplane was necessary when we had inadequate utilization; but if we are now allowed to operate a pattern which gives us maximum utilization, then there is no doubt that the most modern machine is the most economical."

Against a background of stormy skies, typical of many Middle East situations, a Canberra B.2 of No 5 Sqn, Royal Rhodesian Air Force, touches down at RAF Akrotiri during a MEAF detachment by the squadron

The RAF's Oldest Oversea Command

By NORMAN MACMILLAN

MIDDLE EAST AIR FORCE

THE Middle East is the oldest oversea command in the RAF. It came into being in the middle of the First World War and has continued ever since. At the end of the Second World War its geographical area reached its maximum, extending from Malta to Mauripur and Kurdistan to Kenya. But it has suffered many vicissitudes, not least when Sir Winston Churchill agreed to withdrawal from the canal bases, and again when Mr Sandys decided to separate Aden from it. I believe it might be true to say that not every high-ranking RAF officer endorsed the splitting-up of the air forces in the area which includes Cyprus, Aden and Kenya into their present organization.

MEAF is a relatively small command today. Like FEAF it is self-contained, but can be reinforced far more rapidly from the UK. Its strategic situation is therefore somewhat different from that of FEAF.

Episkopi in Cyprus is the headquarters of MEAF. It is a small place high on the tall cliffs that rise on the south coast of the island. When I visited the headquarters I found them very pleasant, with new buildings, containing offices extremely well lighted by large windows.

The changed and changing situation in the Middle East constantly confronts MEAF with new problems, needing an agile mind in command if efficiency is to be maintained to meet any emergency in the surrounding uncertain lands. In swift succession MEAF has witnessed the establishment of a republic in Egypt and its union with Syria to form the UAR; the Anglo-French attack on Egypt; the Cyprian terror of EOKA; the murder of Faisal in Iraq and the setting-up of a new regime there. No other air command has had to be so constantly on guard against such perils. It is a tribute to MEAF that these have been surmounted with the Command intact, although operating within a smaller perimeter of activity.

With RAF withdrawal from Habbaniya, the airfields under MEAF control were reduced to three—Akrotiri and Nicosia in Cyprus and El Adem in Cyrenaica. This is the difficulty currently faced by this Command. The flexibility and power of dispersal of its Canberra hitting force are gravely affected by the present situation in the Middle East. Its flying routes both southward and eastward have been thrust far off direct-line flight planning, thus adding to the mileage between stops—so involving either a reduction of load in order to carry more fuel, or a reduction in former stage-length wherever that may be possible.

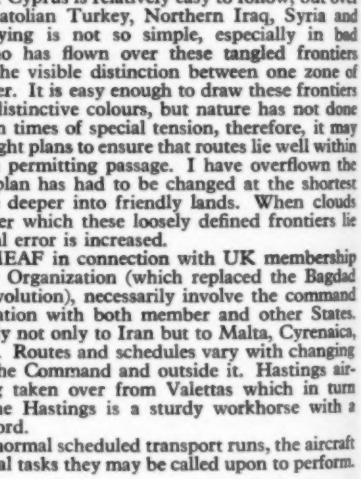
Transport Command and charter aircraft of Hunting-Clan aid MEAF. Comet 2s may be used for casualty evacuation to the UK. The Command also has its own self-contained transport and communication units. The sea area within the responsibility of MEAF is now comparatively small and maritime reconaissance from Cyprus has been carried out by detachments of Shackletons from Malta and RN Gannets; additionally, the Command's transport squadron keeps one Hastings on permanent standby for sea-air and land-air rescue.

There is a flight corridor for aircraft routed to Cyprus. Those contravening it have been liable to interception by day or night, by fighters equipped with AI radar. Most of the contravening aircraft have been on the civil register.

A corridor to insular Cyprus is relatively easy to follow, but over the wild lands of Anatolian Turkey, Northern Iraq, Syria and Iran such corridor-flying is not so simple, especially in bad weather. Anyone who has flown over these tangled frontiers knows how slight is the visible distinction between one zone of sovereignty and another. It is easy enough to draw these frontiers on a map and apply distinctive colours, but nature has not done this on the ground. In times of special tension, therefore, it may be necessary to alter flight plans to ensure that routes lie well within the frontiers of States permitting passage. I have overflown the area when the flight plan has had to be changed at the shortest notice to take a route deeper into friendly lands. When clouds envelop the region over which these loosely defined frontiers lie the risk of navigational error is increased.

The functions of MEAF in connection with UK membership of the Central Treaty Organization (which replaced the Bagdad Pact after the Iraq revolution), necessarily involve the command in lines of communication with both member and other States. Its transport aircraft fly not only to Iran but to Malta, Cyrenaica, Bahrein, Aden, Kenya. Routes and schedules vary with changing requirements within the Command and outside it. Hastings aircraft are used, having taken over from Valettas which in turn replaced Dakotas. The Hastings is a sturdy workhorse with a magnificent safety record.

In addition to their normal scheduled transport runs, the aircraft are ready for any special tasks they may be called upon to perform.



Air Marshal Sir William MacDonald (right), C-in-C of the Middle East Air Force, receiving from Air Cdre C. B. E. Burt-Andrews, commandant of the Pakistan Air Force Staff College, a representation of the PAF badge, to commemorate a visit to MEAF last year by college staff and students

They flew troops and jeeps to Oman during the trouble there when an attempt was made to overthrow the Sultan. They took part in the airlift into Jordan when Faisal of Iraq was murdered. They perform Paramed (Parachute Medical Team) duties and sea, mountain and desert rescue; casualty evacuation; paratrooping if required; and calibrate airfield aids. The Hastings are flown by a crew of six—two pilots, navigator, signaller, engineer and quartermaster.

This transport rôle is carried out by the justly famous No 70 Sqn, which was commanded in France from January to June 1917 by Maj A. W. (now Marshal of the RAF Lord) Tedder, during part of the period when it flew Sopwith 1½-Strutters. It was the first 1½-Strutter RFC squadron to take the field, being dispatched to France by individual flights between May and July 1916 because aircraft were not available to equip the whole squadron and reinforcement in France was urgently needed by this progenitor of the two-seat fighter class of aircraft.

I discovered when I visited it in the Middle East that 70 Sqn is described in its crest as "LXX" Squadron and asked why this should be so. I was told that all pre-1918 RFC squadrons are permitted to use Roman numerals (presumably for other than everyday writing usage). I wonder that more do not do so.

I travelled in one of the squadron's Hastings from El Adem to Nicosia. It bore the name *Hector*, that son of Priam, king of Troy, and a valiant fighter whom Achilles slew. As we descended over the Nicosian plain the darkening blue hills of Troödos and Kyrenia embattled the already star-twinkling sky, and I thought of Shakespeare's lines:—

> "Look, Hector, how the sun begins to set;
> How ugly night comes breathing at his heels;
> Even with the vail and dark'ning of the sun,
> To close the day up. . . ."

The flight plan had been for "about 2½ hours." My own timing from take-off to touch-down was exactly that to the minute. I noted in my diary that "we crossed the North African coast where great wadies carved the tawny cliffs into land islands and twisting serpents of gorge and steep slope. These wadies cut the land down to the very sea and on either side of them the reddish-yellow ground fell away in steep cliffs into blue water whose movement was that day so slight that no foam broke upon the silent shore. Thereafter it was an over-sea flight at 9,000ft in sunshine and blue sky, but below us strato-cumulus clouds threw dark shadows on the sun-mirroring mercury that seemed the surface of the burnished inland sea that afternoon." It was a peaceful passage. Nearer Cyprus the water's surface became rippled with the lines of wind-borne waves, and when we got out of the aircraft a stiff, cold wind blew, effective as a refrigerator in evaporating one's body heat with cruel speed: it was the evening wind that blows over the Mesaoria, or central plain of Cyprus, at sundown.

Why *Hector* for this RAF transport, you may ask? The answer lies again in squadron tradition, for, since its earliest days, LXX Sqn has used for its aircraft the names of ancient Greek, Roman and other classical heroes—Hannibal, Hercules, Hector. I am not certain when it first used these names. Possibly when equipped with Vimy and Vernon aircraft in the Middle East and on the air-mail run between Cairo and Bagdad which opened in 1921; for at that time 45 Sqn, another air-mailer operator, named its similar aircraft *Venus, Valkyrie, Vagabond, Argo, Ancaeus, Aurora*. . . . Nor do I know whether these names were official or unofficial, but they were a useful means of referring to a particular aircraft and their dithyrambic sound gave aircrews more pleasure than did prosaic identification by letter(s) and number. The Americans are more prone to this practice than the British, but their names are chosen for their wit, or, like pin-ups, for their association with some living lady. Either way, the practice gives personality to an aeroplane.

In LXX Sqn the tour is for 2½ years. Maximum flying allowed is 1,000hr a year, 300 in three months, 120 in one month. As a whole, the squadron probably flies between 600 and 800hr every month. It valiantly upholds its long and gallant tradition, and as a former member of its rival 45 Sqn I was proud to be able to enter in my logbook a journey with the old squadron which, although regarded by us with rivalry in the First World War, I have so long admired.

Nothing in Cyprus has been so fascinating as the work of the Sycamore helicopter squadron which started in May 1955 as a communication flight with a search and rescue responsibility. It had only one Sycamore when the EOKA trouble began. By August 1956 the unit had 13 aircraft and 15 pilots, but was still termed a flight until October 1956 when it became No 284 Sqn, with corresponding promotion from flight lieutenant to squadron leader for the CO, Peter Fahy, who had nursed it from the beginning. In mid-1959 it became No 103 Sqn in accordance with Air Ministry policy of keeping alive the numbers of squadrons with the longest histories, by re-numbering some of the units retained in the smaller modern Air Force.

Most of the squadron's work during its build-up was on security reconnaissances and communication flights with the Army and the civil authorities. At about the same time trials of dropping troops in the hills against terrorists were begun. The first operational drop was made in September 1956. Troops were lifted at Prodhomos from a football field surrounded by trees and transported about 10-15 miles to a well-wooded area around Milikouri, together with kit, water, food and radio equipment and other items sufficient for two weeks.

In November 1956 the Suez operation interfered with the local work of the squadron. Search and rescue took top priority at Nicosia and Akrotiri, but no calls were received for the Sycamores on immediate standby. The first three to four months after Suez provided the busiest time for the squadron, and in March 1957 it flew over 360hr on internal security work, including troop drops, supply sorties, communication flights, reconnaissances, casevac duty and VIP transport.

Before joining the squadron, pilots were required to have had some 18 months' helicopter experience. They were put through a course of about 14 days of island flying, which is quite different from flight in the UK. At the end of this course they went straight into operations, with a probable total helicopter experience of about 300hr. (I cannot help comparing this with the total of about 30 hours' passenger, duel and solo experience which was all that was deemed necessary to make a pilot operational in early 1917.) At the peak of flying operations in Cyprus helicopter pilots flew about 40hr a month, which later fell to about one half of that figure, a reduction largely due to the increase in the squadron's pilot establishment. Probably 300hr a year would be average time for a helicopter pilot.

The squadron reckons to obtain about 80 per cent serviceability with helicopters, with about 15 per cent of its aircraft on inspection leaving about 5 per cent for non-routine interruption of flying. When operating from the hills, ground crews were flown up to service the aicraft and to act as dispatchers on supply drops.

In operations of the kind carried out in Cyprus during the emergency, casevac became an important responsibility and helicopters stood by for this from dawn to dusk daily on a 20-minute basis. The average time in responding to calls was four minutes.

A Sycamore of No 103 (formerly 284) Sqn on one of its "landing grounds" in the Troödos Mountains in Cyprus

Four or five cases were flown in at night. Civilian personnel (e.g. the forestry commission) were also casevacuated if requested by the civil authority.

The highest mountain in Cyprus is Mt Troödos (6,403ft). The highest small helicopter landing ground was sited at 5,500ft to communicate with the RAF signals station at about 6,000ft up, the highest RAF station in the world today.

For operations with the Army the secretariat of the Director of Operations' chief of staff put the squadron into direct contact with the Infantry Brigade concerned and thereafter operational planning was done on the spot or with the particular regiment. As elsewhere, helicopters were employed to do work which other and cheaper forms of transport were unable to provide. The troop-lift might (as we have seen) be over quite a small distance and the troops would reach the lift area by surface transport, or on foot. But even over quite small distances surprise could be effected by the mobility of helicopters and their power to land troops in places difficult of access by surface movements and at a speed unsurpassed by any other type of transport. When used against forces not so equipped, the helicopter can be a priceless asset.

M/Plt W. Szmaciarz, of the MEAF Communication Squadron, flew me from Nicosia in a Meteor 7 over the Troödos massif to Akrotiri. Flashing over that wild range of mountains on whose upstanding chines the pine trees stand out like the black stubble on a castaway's face, ridge after ridge sped below; isolated villages,

A Hastings of No 70 Sqn, which recently completed 40 years' continuous operations in the Middle East, in flight over Kyrenia Harbour

MIDDLE EAST AIR FORCE . . .

none of measurable size, gashed surface mines (including the world's largest asbestos mine at Amiandos), a grand hotel and a great monastery rushed across my vision with a rapidity that left only a blurred impression of geography. My limited view from the cockpit was amplified only by the old expedient of weaving and banking to give a series of new (yet each still fixed) lines of sight. So one could take in a vast sweep of the massif, gain a grand idea of its vaults and steeps, its immense stature, its timelessness and unapproachability, its security for fugitives, its natural setting for the game of hide and seek.

Afterwards I flew over the massif in a Sycamore piloted by Sgt L. W. R. Booth. Within the transparent cockpit one could see downwards, forward, upwards and sideways. Since the ancient boxkites no aircraft has given its pilot the view that those early machines and the helicopter share in common. The boxkite's top (and only) speed was about 20 or 30 m.p.h. slower than the Sycamore's cruising speed and occasionally, when very close to an objective, even the helicopter's speed seems excessive when one wants to make an intensive study of a locality; but this can always be overcome by slowing down or hovering, although only at the expense of range.

Flying in the Sycamore I saw exactly what their operations had involved, how great was the flying skill each sortie demanded. We flew low over the pine-clad hills, which almost everywhere precluded alighting. The massif was composed of ridge upon ridge of knife-like summits, up whose steep sides the trees straggled in diminishing density; but always the sharp cone-shapes of those trees were present, dangerous as spears of timber in an ancient stockade. Villages were infrequent, but even in those mountains many possessed a football ground and every one of these was a usable helicopter landing zone. Other landing-places were specially constructed. We hovered over one made by shaving off the top of a knife-edge its stubble of pines and rubble until a platform just big enough to take the Sycamore was rough-formed on that unlikely place. Booth all but set his wheels down and from it the ground fell away all round (except for the very narrow after-ridge) at an angle which must have been about 80°. It was an eyrie which gave armed men the power to control a mountain road that wound up like an ochreous serpent, twisting around precipices.

Clouds rolled down the steep slopes of Mt Troödos. We flew between cloud and precipice, sometimes seemingly scraping our wheels on the crags and simultaneously swirling the white vapour with our rotor; again approaching a rising steep where a swift climb was needed to carry us clear of the summit, an instant after gazing down into a valley that fell sheer for perhaps 2,000ft. We cruised away down a northerly running spur, flew over the immaculate American-owned Mavrovouni mine whose product, copper, is presumed to be the primitive of the island's name. On reaching the sea we turned eastward over the plain, whose surface reminded me of wild Dartmoor-land kibbled into one monotonous level of monochromatic dingy green. Over the melancholy Mesaoria we returned to Nicosia aerodrome, seeing beyond it the Venetian-walled capital city and its cathedral's twin towers.

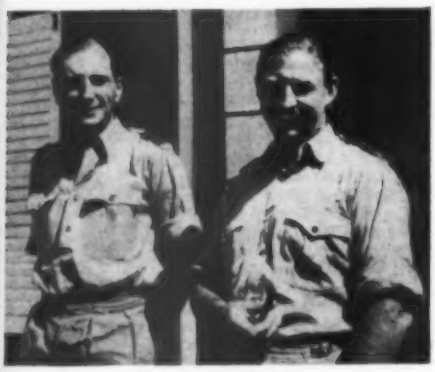
It is not easy to assess the respective work of the helicopter pilots in Malaya and Cyprus, so alike are they, yet so different. The steaming jungle, the craggy pine-lands, the so-similar hill-shapes and not-so-varying heights. The changing temperatures and verdures of Cyprus with its cold winters and overheated summers; the constancy of verdure, temperature and rain of near equatorial Malaya: these I think are the chief differences. The hazards are probably about equal and they are (or can be) grave. To the chopper aircrews in both places the nation owes a real debt. They are a wonderful team of dedicated men. Seldom does one find such enthusiasm for their professional work in people now. And I believe they get the best out of flying that flying has to offer today: they fly close to the earth, know their way inch by inch, not by beacons but by signs and portents that the jet captains will never know. They do not overfly continents, but they do know their own localities. They operate with so many opportunities for doing good, as life-savers and work-savers.

Akrotiri is a great air base. It provides the operational facilities that have come to be known as NATO standard. To the southward, on a gently rising slope, is the living accommodation for married and unmarried personnel. The men's quarters were the best I have seen on any RAF station, comfortable, six in a room, with corporals' rooms at either end. Ablutions and sanitation were of an equally high standard. The buldings were commodious, yet separated, so in the hot weather there should be plenty of air circulation about them. Each man had his own lockers and good arrangements for keeping kit. The station commander's house stood on the top of the gentle hill, overlooking the whole station and the salt lake beyond from its ample windows and unshaded garden. In the garden were beautiful flat, white pebbles, of oval shape and about six inches long and perhaps three wide, found on the nearby beaches, forming a charming decoration. There is safe bathing on beaches of the peninsula, even for the children. If there is one drawback it is that Akrotiri must be largely a self-contained community. Its residents are remote from urban amenities, but they can make their own pleasures, as some have already done in archæological (and avian) research in a land where there is a wealth of hidden lore. Not far distant stands the Crusader castle of Kolossi, reminder of the martial history of the area where Akrotiri air base, pivot of the Middle East Air Force, now stands.

With the signing of the London Agreement the situation in Cyprus has again changed, as it has changed so often before. So far as the RAF is concerned, Britain retains sovereignty over Akrotiri-Episkopi, Dakalia and a number of lesser places, such as the station on Mt Troödos, where necessary installations (chiefly for signals communications) are sited.

Nicosia airfield, which was taken over during the emergency, has been returned to the Cypriots and is again a joint-user airfield, where the RAF exercise rights to operate transport, communications, helicopter and possibly reconnaissance aircraft.

While the future success of this arrangement must depend on the friendly relationship between the RAF and the Cypriots, in peacetime there is no reason why it should not succeed, for the latter are a friendly people, predisposed to like the British, and the RAF are always ready to be friends wherever they go. If war should come no one can forecast what complications might arise at the higher levels of international policy, but perhaps the present more universally expressed desires for world peace may (and I only say *may*) prevent such problems presenting themselves in Cyprus, where the UK national base in the Eastern Mediterranean supports CENTO, serves as an early warning for NATO, provides a useful air transport staging-post, and might become the headquarters of a unified tripl'e-Service command if the difficulties of such unification can be resolved.



The station commander at Akrotiri, Gp Capt A. H. Humphrey (left), with the Wg Cdr Admin, Wg Cdr R. C. Haine, both of whom were Battle of Britain pilots

FIRESTREAK

THE DESIGN OF BRITAIN'S FIRST AIR-TO-AIR MISSILE

UNDER the code name of Blue Jay, de Havilland Propellers Ltd have since 1951 held the prime contract for Britain's first operational air-to-air guided missile. Although an extensive history of this project was contained in our issue of May 3, 1957, it has not previously been possible to say very much about its actual design and development. Now that it is in service with squadrons of RAF Fighter Command and the Royal Navy, the veil of security has been partially drawn aside, and in a Royal Aeronautical Society main lecture, read before the Bristol branch on February 17, one of the prime contractor's senior staff has presented the story for the first time in public.

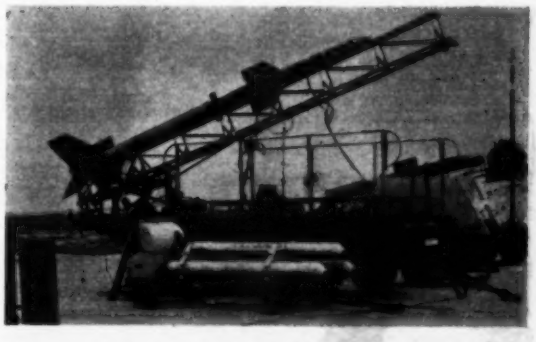
Author of the paper was G. H. F. Brown. He was one of the founders of the guided-weapon team formed in 1951, and was made chief designer of the new group. In 1956 he became assistant chief engineer of the company, rising to deputy chief engineer two years later. He was appointed to his present post of chief engineer (propellers, aircraft and industrial equipment) when a reorganization of the company's engineering division was brought about in November 1959. He handed over his missile responsibilities to Dr G. H. Hough, who then became chief engineer (air-to-air GW).

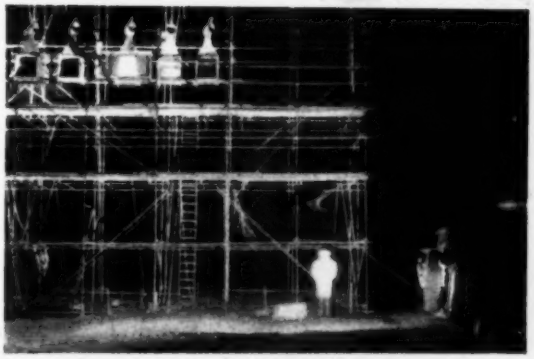
In the design of an air-to-air weapon [said the lecturer] the question of size is paramount. In the case of Firestreak, the requirement is for an aircraft load of a number of small weapons, resulting in a high probability of success for a given reliability, and the ability to make several attacks in one sortie. The fairly short range fixes the size of the collector mirror, and hence the size of the infra-red homing head, and also indirectly the size of the propulsion system. The airframe is correspondingly small, and this limits the payload to a modest warhead, which must be guided accurately to the target and triggered precisely.

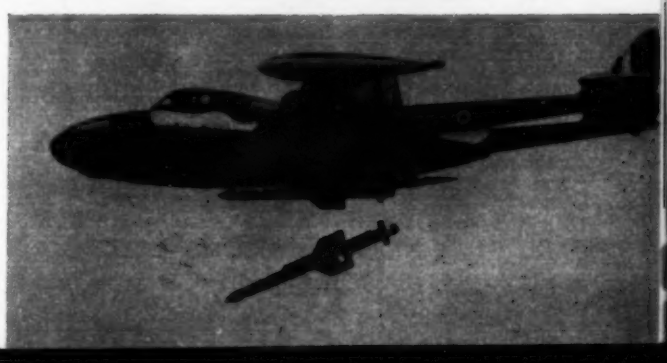
Each airborne system is mounted in the front half of the body, and is easily removed from, a rigid chassis when the outer skin of the missile is removed. In the rear half is an integral boost motor and air bottle. The forward actuators are linked to the fins by cables; the fins are locked centrally before launching.

A variety of possible launching attitudes meant that a no-run launching system would be unsatisfactory, and so small feet on the missile were arranged to fit into rails in the launching shoe. The missile is maintained with its c.g. approximately under the bomb slip, by means of a shear bolt—strong enough to hold during catapulting or deck-landing but able to shear at once on firing, even when the boost motor is very cold. The rails provide a run of approximately 15in. The parent aircraft provides both heating and cooling air, through shearable dowels. As the missile-armed time is increased, so must the quantity of cooling air rise. The optimum system is that in which the air is passed through heat exchangers in which ammonia is allowed to boil off. Some of the electronics are cooled by using the ammonia directly, to cool a heat sink on which the components are mounted. This ammonia is carried at the rear of the launching shoe in rapidly replaceable bottles. Electric services through the pylon, launcher and missile pass through a butt-type contact devoid of moving parts.

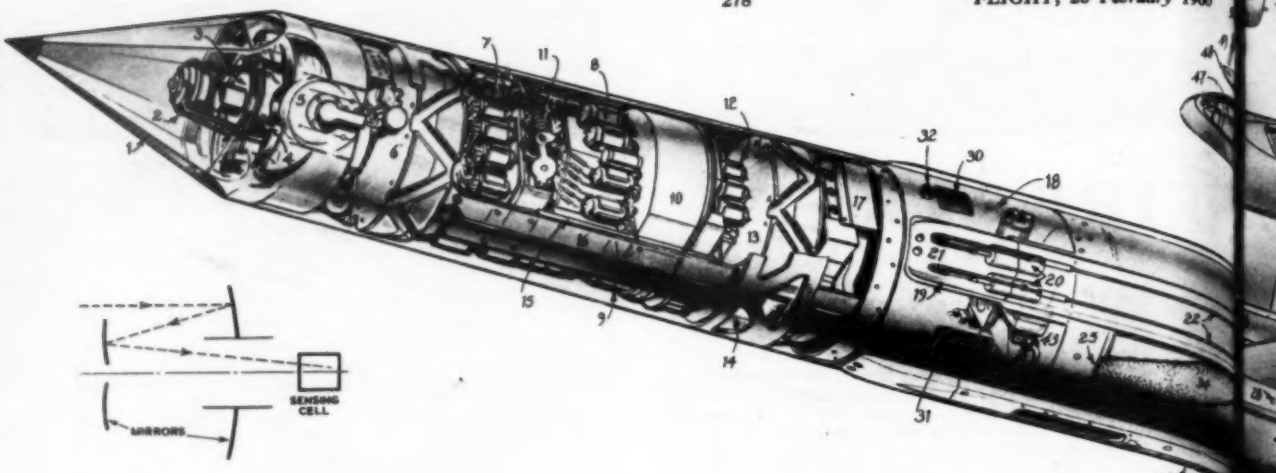
Several launching positions were tried to prove a variety of carrying configurations, and the basic work for a wing-tip installation was carried out on a ground rig. During winterization trials, water was sprayed on to form a complete coat of ice, but the system still functioned. Before the missile could be flown on or launched from an aircraft, its aerodynamic performance had to be established. After boosting from the ground, telemetered results of programmed lateral demands enabled the wings to be positioned correctly. Then the missiles were flown on handling trials carried by a Venom NF.2 (picture, right). [*Continued overleaf*]







The four illustrations on the right depict aspects of the missile's early development. From the top: one of the ground-launched aerodynamic-research rounds; the mesh target at Larkhill (note heaters, and hole made by missile); loading a guided Blue Jay on to one of the two Venom NF.2s (the first aircraft ever to fire the missile); and a free-dropping trial from one of the same machines



FIRESTREAK...

1 Eight-panel glass nose
2 Telescope system
3 Mirror
4 Stabilized homing head
5 Gimbal mountings
6 Front fuze assembly
7 Guidance electronics
8 Control electronics
9 Rotary converter
10 Rate-gyro unit
11 Rectifiers
12 Fuze electronics
13 Rear fuze assembly
14 Fuze windows
15 Heat exchanger
16 Unit mounting rails
17 Power pack
18 Actuator casting
19 Actuator assembly
20 Actuator cylinders
21 Control-rod chain and sprockets
22 Control pull-rods
23 Control fin
24 Control casting
25 Thrust casting
26 Front fairing
27 Wing mounting feet
28 Wing fixing bolts
29 One-piece wing
30 Services socket
31 Monitoring point
32 Shear-pin socket
33 Motor canister
34 Solid-fuel charge
35 Motor blast tube
36 Exhaust nozzle
37 Initiator
38 Toroidal air bottle, round blast tube
39 Air-bottle charging valve
40 Unstressed boat tail
41 Warhead mounting casting
42 Warhead
43 Starting and reducing valve

Launching shoe

44 Launching shoe
45 Launching rails
46 Launching feet
47 Services butt-connector
48 Pressure pad
49 Ammonia dowel
50 Shear pin
51 Shear-pin nut
52 Cover
53 Cold-air union plug
54 Hot-air union plug
55 Sealing ring
56 Cylinder nut
57 Insulating ring
58 Initiator assembly
59 Shoe-retaining threads
60 Locating dogs
61 Ammonia cylinder
62 Fairing
63 Locating spigot
64 Sling point

"Flight" photograph

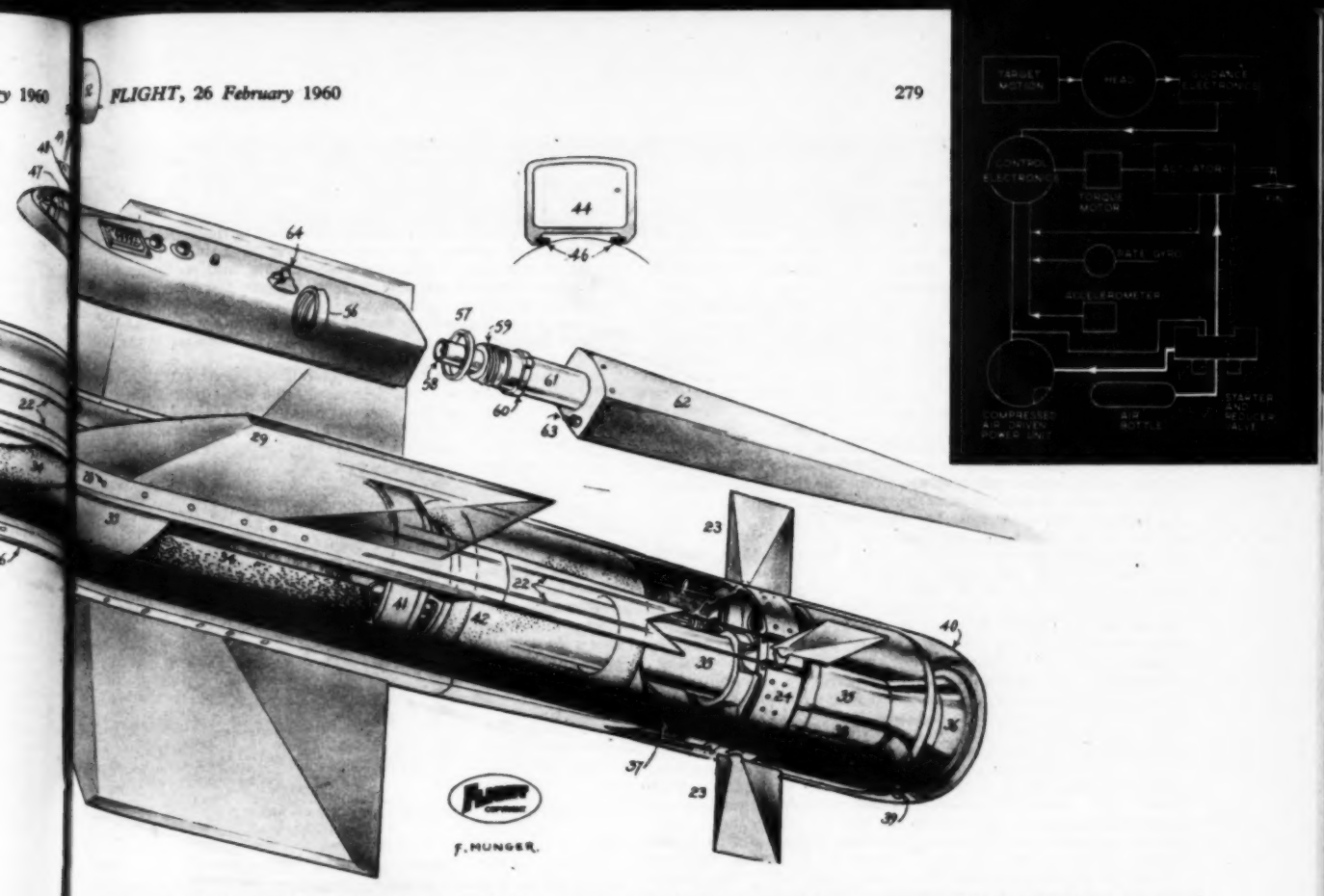
Tunnel tests had shown that on some aircraft, local airflows caused a jettisoned missile to strike some part of the aircraft structure, and so jettisoning by firing and jettisoning by gun were investigated. The latter system is satisfactory only when the thrust line of the gun passes ahead of the missile c.g.

In the early development of the homing head, permission to use the Bristol/Ferranti CTV.4 test vehicle was obtained, and the modified vehicle was known as HTV. This coasted after boost from a 3×5in LAP unit from a trolley capable of variation in elevation and bearing. About 40 unguided HTVs were used, on such work as the evaluation of noise, g, loadings, vibration and temperature. These rounds indicated the need to expand the ground facilities and environmental equipment and testing.

Guided trials were carried out with ground-launched rounds, gas burners providing the infra-red target. By using a specially lightened missile, and at separation using the missile motor as a second stage, a high-speed round was created to prove temperature, shock, and dynamic loading on the homing head (at that time such work could not be done on the ground). It was also established that, while spherical domes were addicted to the collection of ice, the pointed type was not. An approach to protection against icing in carried flight was the provision of a plastic sheath over the front of the missile, removed by a small rocket at the time of arming. Tunnel tests showed that the sheath came forward of its own volition at a certain airspeed.

Airborne power was designed around the RAE suggestion that all such supplies should be of high frequency. A small turbo-alternator, controlled to close tolerances of voltage and frequency, was fed to each system via a separate powerpack. The very close frequency control enabled alternator r.p.m. to be used as a timing device to bring in a sequence of operations, such as firing the rocket motor, progressively changing the k-factor after launching, arming the fuze and initiating self-destruction.

Components in an air-to-air missile are subjected to temperature changes from high-speed sea-level tropical at one extreme to high-altitude cruising at the other. The soaked condition is important, and it was established that components near the outer skin approximate to the outside temperature within five minutes.



In preparing the drawing above, a "Flight" artist worked from a manufacturer's illustration and from components exhibited at SBAC displays since 1957. Security still precludes the publishing of details of the fuzing system, and the exact location of the warhead has been determined by calculation. The inset near the nose depicts the optics of the mirror system, while a complete functional block diagram is included at upper right. The photograph on the opposite page shows how two Firestreaks are carried by the English Electric Lightning, in this case a T.4 two-seater

Critical components were thermistored and recorded photographically, revealing the need for a cooling system for the electronics and a heating system for mechanical components.

Ground testing was completed at Larkhill, and the first fully guided round successfully struck the 40ft-square wire-mesh target. The first air-launched guided round was launched about a year later at Aberporth, and destroyed a Firefly U.8 target. Most subsequent trials were at Woomera, where the improved weather increased the rate of launchings. A Canberra was the first launching aircraft, and subsequently two Avon Sabres were converted. Both types gave excellent service, and continued with the Joint Services Trials Unit evaluation of the weapon.

Whereas the launching of Firestreak in anger is relatively easy, the precise positioning of a trials aircraft and target in speed, altitude, and manœuvre, over a designated instrumented area, requires considerable rehearsal. (In fact, several rounds struck targets, yet the trials *as trials* were failures.) Both fighter and target fly a standard "race track" from take-off. Their tracks are drawn on radar plotting tables for monitoring by the air director. Ahead of the launching point a block of numbered gates is drawn across the firing track, and the director can assess the adjustment necessary according to which gate the fighter runs through. Accurate relationship between fighter and target is maintained by ground control of the fighter, as no deviation to the target flight plan is permitted. Even the smallest error in timing over the instrumented area can have disastrous effects in an investigation of the operational limits of the weapon.

A discussion of the reasons underlying Firestreak's configuration may be of interest. The IR guidance is frequency modulated, and the chopper system ensures that the modulation is independent of the incident-energy level. The phase of the modulation compared to a reference generator describes the target direction in respect of the missile axis, and the frequency deviation describes angular error with respect to the optical axis. The error signals are amplified and fed to the torque motors as d.c. currents.

Owing to its freedom from noise, the guidance can provide accurate steering signals to within close range of the target. The small miss-distance requirement can therefore be met by using a control system with a rapid response; and the missile can manœuvre on its demand limits until a late stage, and then recover sufficiently rapidly to achieve accurate homing in the final seconds. In the basic concept, twist-and-steer was discarded because the high roll rates were incompatible with some aspects of the IR system then partially developed (the solution adopted in some larger missiles, of using a one-way-up control system with the necessity for a 180° roll at each reversal of the guidance demand, is not acceptable in a weapon of this type).

The guidance range requirement is met by a small optical unit collecting IR energy from the target engines. This is mounted directly on the homing-head gyro, and the optical error signals demand gyro precession torques to give a measure of the components of sight-line spin. This is simpler and more compact than driving by a servo slaved to a space gyro, but it implies higher gimbal inertias; it is for this reason that rapid roll must be avoided, particularly when the head is deflected to look at a large angle to the body axis.

All control actuators and functional electronics are concentrated in the front of the missile, while the motor and warhead occupy the rear. The mechanical layout therefore makes canard controls attractive. These change the actuator requirement slightly, for the upwash field tends to make control power deteriorate at smaller deflections than for tail controls. Thus larger control surfaces must be used, and the actuator needs greater power but smaller deflection than that for tail controls. What finally tipped the balance against the canard was the unpredictable direction of roll arising from aileron deflection (resulting from asymmetric downwash on the wings). Moving-wing configurations were discarded because the actuators must drive wings which have to be of greater area to compensate for the loss of body lift and for root gap losses.

Firestreak is capable of pulling a high g in each wing plane simultaneously and up to high altitudes; but it has to pay a price. Body motion occurring in response to each change of demand can affect the guidance system through gimbal bearing friction and nose aberration. The first produces a guidance motion at right angles to the body motion; the second gives rise to an

FIRESTREAK . . .

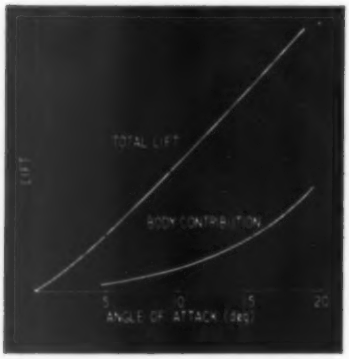
apparent sight-line movement in the plane of the body oscillation. Accordingly, the strictest attention has been given to IR dome aberration, bearing friction levels and balancing. The forecasts of high-altitude instability arising from aberration or viscous friction have not proved true, partly because the frequency response of the control system changes with altitude.

The precession torques which must be applied to the head gyro are proportional to the space rates of spin of the sight-line. The precession currents in the torque motors therefore give straightforward measurements of the spin rate, resolved into the plane of the torque motors, and this can be used for proportional navigation. All that remains is for the missile to be made to turn, in each of the two wing planes, at rates proportional to these precession currents.

Firestreak is launched in a pursuit course, i.e. straight at the target. Dispersions and errors are then removed by a navigational system which varies only slightly from the classic proportional type. In order to achieve this, the precession torques applied to the homing-head gyro must be proportional to the rate of spin of the missile sight-line, resolved into the wing planes. The precession currents are therefore direct measurements; but in practice it is more satisfactory to sense rate of turn by accelerometers placed normal to the body axis. A rate gyro would sense rate of turn of body axis, which differs from that of the flight-path by the rate of change of angle of attack. To some extent this could be overcome by suitable filtering, but the wide range of firing altitudes and speeds renders simple filtering inapplicable. Accordingly, a high-gain accelerometer feedback is stabilized by a rate gyro in pitch and yaw, while filtering decouples the control system from the body-vibration mode.

Since the control system produces acceleration in response to sight-line spin, the ratio of flight-path turn rate to sight-line spin (the k-factor) increases as the weapon slows down. Although no effort has been made to counteract this, the navigation system works well. One point, however, needs particular attention. As angle of attack builds up after launching, the rocket thrust component normal to the flight-path helps the weapon to turn in the desired direction, but this is not sensed by the lateral accelerometers. At low altitudes this effect is negligible, but at high altitude the angle of attack is much greater and could result in the missile oversteering violently during the boost phase.

The missile leaves the fighter with fins fixed centrally, and if the demands from the guidance system are increased steadily from zero to the full k-factor value over the boost phase, the missile navigates smoothly. If the navigation system were switched on suddenly this would result in a violent acceleration oscillation persisting throughout flight (the average acceleration achieved being relatively small). The k-factor is therefore designed to increase gradually and thus provide a smooth build-up of acceleration. Roll-control requirements are fairly simple, it being necessary only to keep the steady roll-rate sufficiently low for the output acceleration to take place in substantially the same plane as the sight-line spin.

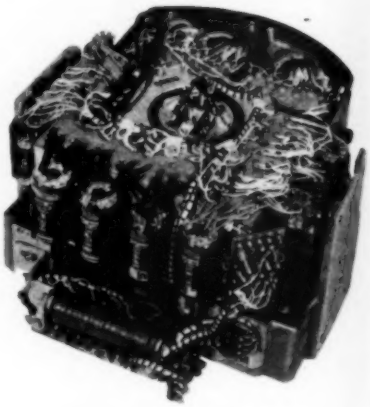


At the upper end of the speed range body lift accounts for a high proportion of the total (arbitrary vertical scale); this point is relevant to discussion of guidance and control on this page

Firestreak has two sets of planes of symmetry, the wing planes and the planes at 45° to them; and in the latter lateral stability is considerably less than in the wing plane. Thus the control system must produce adequate performance over a wider range of static margin than would ideally have been the case. In particular, the missile must be safe with fixed fins at low fighter speeds (when the missile stability is poor), yet must have adequate trim power at high Mach numbers. It is fortunate that a rolling torque develops which prevents the missile from remaining stable at high angles of attack other than in the 45° plane. At low angles of attack Firestreak can be trimmed without rolling torque in any plane. During high-altitude firing, the weapon rolls until the plane of the demand is contained in the 45° plane; all that the roll control system then needs to do is to damp this motion so that the roll rates are acceptable.

Signals from the guidance loop demand accelerations which must be made very rapidly and be very close to those demanded. In the lateral system the most powerful disturbing factor is change of atmospheric pressure with altitude, and so fin angles for the same demand signals are arranged to increase with altitude. The effect on wing performance is unaltered and, despite the presence of the high accelerometer loop gain, the missile tends to be more sluggish at altitude than at sea level. Provision is therefore made for altitude compensation.

Although the missile is capable of pulling very high g at low altitudes, the acceleration is prevented from exceeding a specific level by limiting the guidance demand signal. The latter is amplified by the preamplifier, the output from which is again amplified by a driver magnetic amplifier. The latter is used to drive a Laws relay or transducer, which governs a pneumatic valve controlling a fin actuator. In each lateral plane are three feedback loops, comprising an accelerometer stabilized by a rate gyro and actuator-piston position. Roll control is relatively simple, roll-rate being measured by a gyro, the amplified signals from which are fed to the driver amplifiers for each fin. This represents a zero-demand servo loop, with disturbances fed back as corrections to the fins as ailerons.



Typifying the prime contractor's "potting" techniques for electronic components is the guidance electronics assembly, located just aft of the forward IR fuzing bay

Development of the pneumatic valve took some time. The very small leakage rate could be obtained only by small clearances. These varied with extremes of temperature, and in the cold condition the driving current for unit movement increased. This was rectified by introducing dither, but it was not easy to find the materials which would stand up to the environment and still not pick up under the high-frequency unlubricated dither imposed.

To improve resistance to vibration and climate, electronic components are anchored between printed circuits and sealed into a can. Terminations generally come to the surface through glass insulators, and the whole is potted in a light foamed resin. While this is undoubtedly reliable, it hampers the changing of faulty components. When several sub-units are mounted on one chassis, they are loomed together and dipped in a varnish which binds all loose cables to the surface, protecting them against vibration and moisture (photograph above).

There are two versions of the fire-control to suit aircraft armed with two or four rounds. To cut down sudden asymmetric drag during an attack, provision is made for launching missiles in sequence from alternate wings, particularly when two pairs are selected. Should a missile hang up, or misfire, its presence is taken into account during subsequent firings.

The equipment passes cold air to the missiles when arming takes place and indicates any failure of the aircraft power supplies which would make for an abortive launching. It locks the missile head to the AI radar, provides a scan to increase the beam angle to improve aiming tolerances, samples the IR signals to pick out the true target from noise, and provides pulses which launch the missile on the pressing of the firing button. The fire-control also tells the pilot when the missile is seeing the target with a signal of sufficient strength to ensure that it will lock-on when the firing button is pressed. Pressing the button changes over from aircraft to missile electric supplies, and ignites the boost motor.

Fighter-borne fire-control is packaged in four boxes (three for a two-missile installation, as on the Lightning F.1). Each box has two walls, between which cold air is passed, and the electronics give up their heat to the inner skin. When supersonic flight duration is brief, the cooling air may be discarded.

Straight and Level

POLITICS prevail in the commercially imperfect world of air transport. But isn't this world imperfect largely because politics do prevail? I share the view that the proposals for Britain's new Air Transport Licensing Board, reviewed in this issue, are disappointing: they are fundamentally the expression of the view that politics come first. If we create a body that is in all essentials a puppet of the Minister, it will not properly be able to do its job of promoting British air transport. And then the worried politicians will try to exercise more control, with further detriment to the industry, and so on.

Isn't this a wonderful chance to create an independent executive authority run by professional air transport people? The politicians would, as the advertisements say, be amazed at the difference.

But thank goodness our Minister isn't as "politics first" as some. How about this:

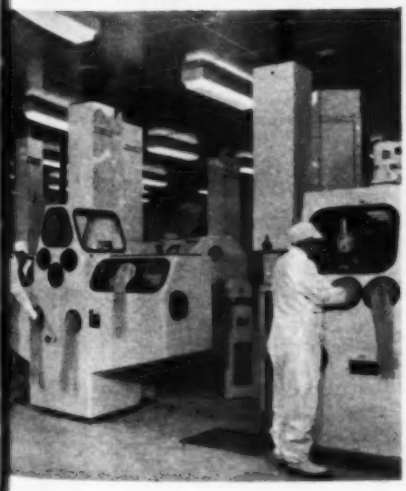
"[*Ghana Airways*] *should give special consideration to the political aspect of its activities rather than the purely commercial side, though expenditure naturally has to be supervised*"—Mr Edusei, Ghana's Transport Minister, on buying out BOAC's interest in Ghana Airways.

● We helped the French a great deal to develop the Caravelle: we gave them the Comet's nose, Rolls-Royce Avon engines, hydraulic system, Redux and numerous other things. But it was a French concept, backed by the French government, and built by half the French aircraft industry. Little did we think that this elegant medium jet—a partner for the Comet, we thought—would be in competition with two generations of British jet airliners in the airliner markets of the world.

It is no secret that many people in BEA would have liked Caravelles as their interim jet. And I have heard senior people in Sud Aviation deplore the fact that we didn't get together with them on the Caravelle in 1957—as they offered us the chance to do.

Now the most respected name in the business, Douglas, moves in. The American firm sees an opportunity to scoop with the Caravelle at least part of the market for which the D.H.121 is intended. They judge that what the Caravelle concedes in speed—80kt—and in other technical respects it makes up in delivery date—about two years.

Can the great resources of the Hawker Siddeley Group, of which D.H. are now a member, advance the D.H.121 to meet this challenge of the Caravelle?



There is something mildly disturbing about this picture. Could it be from an "H" certificate film about the perils of man's mastery of science, etc? Those limply hanging forearms—did they belong to the men on the night shift? [AWA's newly opened beryllium-machining plant at Coventry]

● A reader "notes with great interest" that the basic salary of an Air Marshal has now been increased to £4,124 a year.

This, he feels, offers great advertising possibilities to BEA, some of whose pilots are now demanding £4,200. How about the slogan: "The equivalent of an Air Marshal driving every flight?"

● I learn from *Aviation Week* that bizarre hallucinations may be experienced by operators of space weapon-systems. It seems that test subjects exposed to simulated spaceflight environments for thirty hours in the School of Aviation Medicine's one-man sealed chamber ran a gamut of beliefs that they were seeing gremlins, experiencing colouration changes, and that instruments were melting and dropping off the panel.

So the dawn of spaceflight threatens to be just another morning after.

● How far back does business-flying go? One business aircraft of 1928, a Gipsy Moth, was illustrated in the "then" part of a "then and now" feature on *Flight*'s Sport and Business page recently. A contemporary extract from the *Devon Valley Tribune* indicates how it was used:—

"On Thursday night an aeroplane flying low and circling over the town brought many out of doors. It appeared as if a landing place was being sought.

"This assumption proved to be correct, for ultimately it came down on a field at Blackfaulds Farm. I think I am right when I mention that this is the first time an aeroplane has landed so near to Tilly.

"Information was soon forthcoming that it was the 'Camberwell Beauty' belonging to Mr Norman Jones of Samuel Jones & Co Ltd, who was paying a 'flying' visit from London to Devondale Mill."

Was the Samuel Jones company the first in Britain to operate a business aircraft? You tell me.

● *"The profitability of the half-price fares that the independent airlines are seeking . . . depends not on the price of the aeroplane but on the cost of running it."*

With great respect I must again take *The Economist* to task on a point of airline economics. The cost of running an aeroplane must include the price paid for it.

And the faster the rate of depreciation, obviously, the higher the running cost. Unfortunately, there are a good many people who, like Sir Charles Boost, cannot grasp the point that too high a rate of depreciation, the result of too high a rate of re-equipment, keeps fares up and profits marginal.

Sweepingly to assert, as *The Economist* goes on to assert, that elderly written-down airliners are more expensive to fly than the new jets is, I submit, sheer Boostism.

● On my desk the other day appeared a translation from the Czechoslovakian *Law of September 24, 1956, on Civil Aviation (Air Law)*.

If you are a Czechoslovak citizen, I found, you may own a civil aircraft, but only with the consent of the Ministry of Transport and the agreement of the Ministry of the Interior—and you know what dealing with *two* government departments must be like.

● The Minister of Aviation, flushed with the success of a reshaped aircraft industry, has now infected the independent airlines with mergeritis. A marriage has been arranged between Hunting-Clan and Airwork—*un mariage de raison*, I have no doubt.

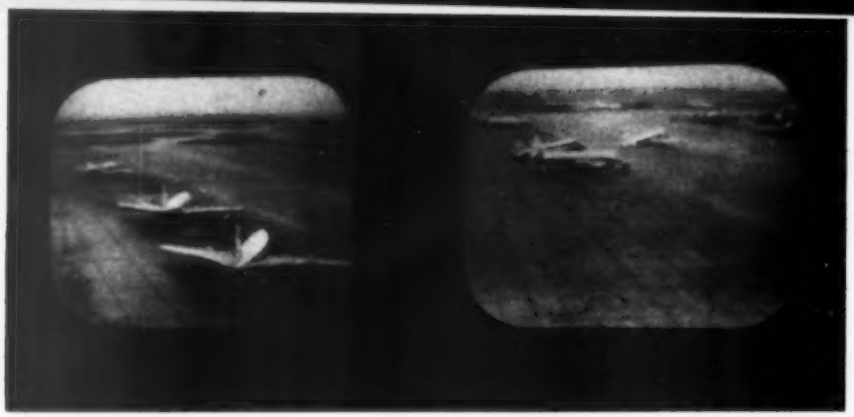
Le raison can only be that the Minister has said something like this to the two independents: "I want to give you a bigger share of British air transport. But I want to make certain that you are technically and financially strong enough to handle the jobs I want you to do. Look here, if you merge, I'll see that you get a 50-50 share of UK-Africa economy class."

I do not know whether that was the carrot that was dangled. But, whatever it was, the Minister was trying to make British air transport take-off backwards. Mergers should be the consequence, not the condition of, a new British air transport pattern.

● Do you know what the initials SBAC stand for?

Society of Both Aircraft Constructors.

ROGER BACON



Pictures of London Airport parking areas produced in the office of the marshalling supervisor by two Marconi BD 871 closed-circuit television cameras (see news-item below)

FLIGHT SYSTEM SURVEY

Gyro Table for the VC10

FOR the full-scale rig to be used to test the control system of the Vickers VC10, Bryans Aeroquipment Ltd are providing the gyro test table illustrated below. The table is extremely rigid and robust and has a gimbal system allowing attitude simulation of the roll, pitch and yaw axes under remote control from a special console. As recorded in the review of automatic landing last week, the complete VC10 power control and autopilot systems are to be tested together on a full-scale rig and the Bryans table will simulate aircraft motion. The manufacturers claim that nothing like it has previously been made available in this country. The table measures 40in × 48in × 45in and is estimated to weigh between six and eight cwt. Power is derived from standard mains supply.

Blue 26 to Jersey

IT has been decided that Airway Blue 26 will once again be established in the spring to provide an alternative route from the London area to the Channel Islands during the summer season. The airway will be withdrawn at midnight on October 31. This supplementary airway was provided last year to lessen the congestion caused by holiday traffic to the Channel Islands, and particularly to Jersey.

Because Blue 26 lies for the major part over the Channel and was in fact only defined by Mayfield NDB in Sussex, Lydd VOR on Dungeness and Jersey NDB, trials were carried out with Decca last November (*Flight* for November 20). This year, it has been decided that Blue 26 will extend from 3,000ft or 4,500ft amsl to flight level 15,500, but that the area above 7,000ft will be entirely a Decca airway, to be used only by aircraft equipped with Decca Navigator. A series of Decca reporting points has been established, particularly to allow aircraft to be held before entering the Channel Islands control zone and before crossing the crowded Amber 1 Airway between London and Paris.

It is intended that largely one-way traffic should be established on Blue 26 and the complementary Red 1 (via Southampton), the direction in each case being determined according to the landing direction at Jersey. This one-way system apparently will not apply to aircraft originating from Guernsey and Alderney and aircraft from certain airfields around London would join Blue 26 at the "Hastings intersection" between the Mayfield NDB leg and the appropriate Lydd VOR radial. Blue 26 above 7,000ft will therefore become the second British Decca airway, the first one being the Amber 1 Decca climb-out route from London Airport.

It is hoped that Decca-defined ATC and navigational procedures compatible with Airway Blue 26 will shortly be developed for use within the Channel Islands control zone.

Marconi A.F. Power Meter

THE new type TF 1347 A.F. power meter recently introduced by Marconi Instruments Ltd is a sensitive, accurate instrument for audio measurements over a range of impedance from 2.5Ω to 20kΩ, in 11 steps. Its frequency characteristic is substantially flat from 50c/s to 20kc/s and its ten power ranges, covering 10mW to 6W, and 5½in meter provide high discrimination.

By means of a multiplier switch and the meter calibration, the output from an audio frequency system may be read directly in units of power, and also in decibels relative to 1mW. The TF 1347 is suitable for a wide variety of audio power measurements in laboratory, production line or field. Its bottom range of 200μW full-scale makes it particularly suitable for low-signal tests, including measurements of noise or quieting in FM receivers.

The three-axis gyro test table and control console being made by Bryans Aeroquipment for the full-scale control rig for the Vickers VC10

TV Watch at London Airport

IN order to allow the marshalling supervisor at London Airport to have a direct view of parking areas he cannot see through the windows of his office in the passenger terminal, two Marconi BD 871 television cameras have been mounted on lighting standards at appropriate points. The illustration above shows the pictures produced in the office from the two cameras. Formerly, the supervisor had to rely solely on radio communications.

The two cameras have been on the standards for some six months, exposed to winter weather, and have suffered no ill effects.

Irish Dopplers

FOR the three Boeing 720s which are to be delivered at the end of 1961, Irish Airlines have ordered nine Canadian Marconi Doppler navigators incorporating duplicated Doppler elements.

The manufacturers also state that a major airline has now completed a 400hr evaluation of the C.M.C. Doppler navigation computer during flights ranging from polar to tropical regions. The report showed that autopilot accuracy improved when it was coupled to the computer and that block times were reduced by virtue of smaller cross-track errors. It was recorded that savings of up to 20min in flight time on Atlantic crossings were achieved by improved navigational accuracy. Apart from a direct saving in fuel and operating costs it was pointed out that with a utilization of 300 days per annum at 12 hours per day, a saving of perhaps 20min per 12 hours would reflect a saving in overhaul time equivalent to some 13 North Atlantic crossings.

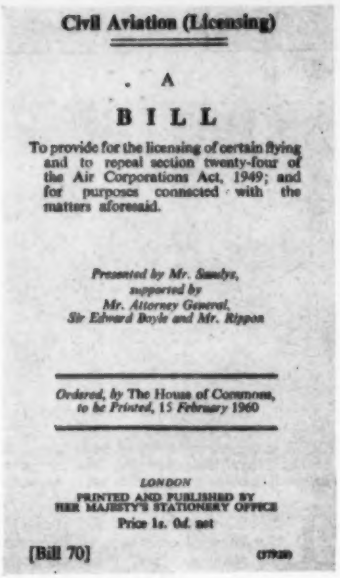
F-104G Bombing System

THE Lockheed F-104Gs for the German Air Force are to be equipped with the M-2 integrated bombing system designed and produced by the Mergenthaler Linotype Co in America. In these columns on November 13 and December 25 the M-2 system was described as being produced under licence from Saab in Sweden, but the American manufacturers have now stated that the M-2 is the proprietary design and product of the Mergenthaler Linotype Co and is not produced under Saab licence.

The Bill and the Board

PROPOSALS FOR THE AIR TRANSPORT LICENSING BOARD MAY REQUIRE SOME CONSIDERABLE REDRAFTING

By J. M. RAMSDEN



Civil Aviation (Licensing)

A

BILL

To provide for the licensing of certain flying and to repeal section twenty-four of the Air Corporations Act, 1949; and for purposes connected with the matters aforesaid.

Presented by Mr. Sandys, supported by Mr. Attorney General, Sir Edward Boyle and Mr. Rippon

Ordered, by The House of Commons, *to be Printed,* 15 *February* 1960

LONDON
PRINTED AND PUBLISHED BY
HER MAJESTY'S STATIONERY OFFICE
Price 1s. 0d. net

[Bill 70] (37920)

A LEADING article in this issue suggests that the proposed Air Transport Licensing Board will not be the powerful autonomous instrument that had been hoped for. All real power, it seems, will be vested in the Minister. The board must, of course, have responsibility to Parliament through a Minister. But the powers over its day-to-day functioning that the Minister proposes to reserve to himself are such that, even if sparingly invoked, they could seriously compromise the board's influence. This would not be so disturbing if it were not for the fact that the board is given no policy control whatsoever over the two basic elements of British international air transport—fares and traffic rights.

The fact that the Minister reserves day-to-day powers might not, as we say, be too disturbing. In practice much would depend upon the men on the board and upon the wisdom of the Minister (there are many statutory powers reserved to Ministers which are never in practice invoked). But a board that has no policy-making powers in respect of international fares and international air agreements—the two fundamental controlling factors in air transport—can only be a yes-agency of the Minister (or, in practice, of the separate Ministry departments responsible). The board may have a mind of its own in these matters—indeed, it *must* have if it is successfully to regulate the industry; but it will have no authority.

The Bill bears signs of having been drafted in some haste. First things do not appear to have been put first, e.g., the terms of reference and constitution of the board have to be picked out from different sections, and the word "or" at the end of Section 1 (2) (a) should presumably read "and." But the chief shortcomings appear to be as follows:—

(1) The Bill proposes that if, in the opinion of the Minister, an application might call for the negotiation of traffic rights which the Minister considers it "inexpedient . . . to seek," the application should be refused "forthwith" [Section 2 (3)].

There are immense opportunities for Ministerial intervention here. There will seldom be any corporation or independent application (other than those for domestic or cabotage routes) which will not have to be interpreted in the context of Britain's international traffic rights. Thus every application will, it seems, first be scrutinized in this light by the Minister; if it looks politically tricky the board will be told to refuse it.

Control over policy-making in matters concerning traffic rights should not be separated from the regulatory authority. The Foreign Office must, of course, have its say, and actual negotiations should be conducted by a Government department. But traffic rights are an integral part of air transport, and the regulatory authority (like the American CAB and the Canadian ATB) should have explicit powers to initiate policy and to interpret agreements. As it is, such powers will remain in the Ministry. Full control in a field vital to the successful working of the board will be physically and psychologically separate. It is true that the Bill proposes that the Minister and the board "shall from time to time consult" about international relations. But implicit in these words is the Minister's intention to maintain the initiative in all matters affecting traffic rights in his own department.

(2) Though domestic fares will be in the control of the board, international and cabotage fares will not [Section 2 (5) (b)].

The board will have no powers to influence the rate-making functions of IATA. Government approval of these fares will still be in the hands of the Minister. *Flight* suggested in its recent proposals for the new board (February 5) that, like the CAB, it should be the Government's agent responsible for the approval of IATA fare recommendations. The board as proposed will have no powers at all here, and no mandate to raise its voice if it considers that IATA's policies are not in the economic interests of Britain's air transport industry. It will have no powers to encourage the co-ordination of the policies of British IATA members, and hence no powers over IATA itself. It will have to be a meek onlooker while a Government department rubber-stamps a fare recommendation which may not, in the board's opinion, be in Britain's interests.

So (to sum up 1 and 2), the board is given no control over either of international air transport's two basic elements—fares and traffic rights. All control is reserved to the Minister; traffic rights will be dealt with by one department, IATA's fare recommendations by another.

(3) The Bill gives the proposed board no power to call upon the airlines for full financial and traffic statistics, and for information about equipment transactions and commercial arrangements with other operators.

The collection and dissemination of statistics should be an important function of the board; without this information the true state of the industry is concealed. No one knows, for example, the financial state of the independents, nor even for certain how much traffic BIATA carried last year. Without full information not only is misrepresentation possible, but decisions are made and policies are shaped on the basis of inadequate knowledge being made available to the industry and to the public. Similarly, the board should have powers to call for, and publish at its discretion, full information about commercial arrangements entered into with other operators—pool agreements, equipment transactions, etc.

(4) Among the matters which the board must "consider in particular" when issuing an air service licence are not included (a) the public interest and (b) the general expansion and promotion of British air transport [Section 2 (2) (a-g)].

The exclusion, or perhaps omission, of these "first principles" may seem trivial; yet this betrays (a) disregard for the consumer, who should be a prime concern of a public-service industry, and (b) disregard for what should be the basic aims and purpose of the regulatory body.

Nowhere in the Bill, in fact, is there to be found any definition of the board's purpose. It is indeed curious that the public interest and the expansion of the industry are not among the matters which the board must "consider in particular" when granting licences. Yet one of the matters which the board *must* consider in particular is explicitly stated to be "*any observations made to the board by the Minister* . . ." How often, one wonders, will these powers of intervention—quite separate from those defined in Section 2 (3)—be exercised?

(5) The Bill makes no provision for the proposed board to conduct its hearings in public.

Flight understands that the Minister believes that hearings should be in public. If so, such provision must be made in the proposed Act now. It is indeed to be hoped that the ATAC's secret courts, so much in conflict with the British way of doing things, will be abolished along with that organization.

(6) The Bill makes no provision for decisions of the proposed board to be published, and for reasons to be given for negative decisions.

It is important that not only should hearings be held in public, but also that the public and the industry should know the reasons for negative decisions. Lack of public accountability here would inevitably suggest that the reasons were bad reasons.

* * *

To sum up, the draft legislation will not, if it is enacted without some quite fundamental changes, establish an autonomous executive air transport authority with any real powers to do the job that needs to be done. Naturally, any such body should (like the ARB) have responsibility to Parliament through a Minister. But the powers which the Minister of Aviation proposes to reserve to himself, and the complete control he proposes to retain over policy on international fares and traffic rights, suggest that the new board is likely to be a mere puppet of the Minister.

Britain needs a team of professional air transport people delegated with complete responsibility for the economic regulation of British air transport. The nation needs, too, a compact national repository of expert knowledge and skills respected not only by our airlines and Government but also by foreign airlines and governments. Instead of establishing this we are in danger of creating a machine which will be sadly underpowered. Indeed, the proposed board will be little more than the ATAC with a new name, a bigger staff, and the authority to issue licences, which the ATAC possesses *de facto* anyway.

[*The Bill, p.291; leading article, p.261; "Straight and Level," p.281*]

Oldest Aeronautical Society

THE STORY OF THE RAeS: PART 3

By FRANK H. SMITH

THIS is the third and closing article in Mr Smith's survey of 94 years of the Royal Aeronautical Society as reflected in the pages of its Journal. Earlier instalments were in our issues of January 15 and 29.

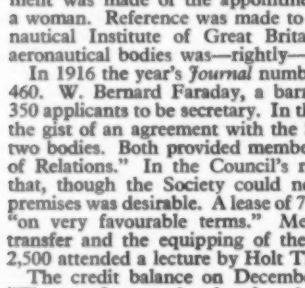
THE first number of the Society's *Journal* to appear during the First World War (October 1914) opens with an appeal for subscriptions. Balance at the bank was about £140. The volumes for 1915 and 1916 are pathetically slim. The annual general meeting for 1914 was postponed from March until May, when it was combined with the Wilbur Wright Lecture. In the July-September number was a notice that the office would be open only in the morning, because of the pre-occupation of the secretary and members with war work; but January 1916 saw it open again during the whole day.

That year, too, saw the annual general meeting and the Wilbur Wright Lecture combined, and on this occasion it was a notable one—"The Life and Work of Wilbur Wright," by Griffith Brewer. Celebration of the fiftieth anniversary of the Society was postponed until after the war. At the a.g.m. the council welcomed the recent formation of the new body representing the trade interests of the aeronautical industry—in short, the Society of British Aircraft Constructors. The Secretary's resignation was announced in the last number of the *Journal* for the year but an announcement was made of the appointment of an assistant secretary—a woman. Reference was made to another body called the Aeronautical Institute of Great Britain and the multiplication of aeronautical bodies was—rightly—deplored.

In 1916 the year's *Journal* numbered 165 pages; in 1917 it was 460. W. Bernard Faraday, a barrister, had been selected from 350 applicants to be secretary. In the January number was printed the gist of an agreement with the SBAC as to the spheres of the two bodies. Both provided members for a "Standing Committee of Relations." In the Council's report for 1916-17 it was said that, though the Society could not afford it, a move to larger premises was desirable. A lease of 7 Albemarle Street was obtained "on very favourable terms." Members stood the cost of the transfer and the equipping of the new offices. An audience of 2,500 attended a lecture by Holt Thomas on May 30.

The credit balance on December 31, 1916, was £704 9s 4d. "The past five months, therefore, have been by far the most prosperous in the Society's history" says the council's report. In the October-December (1917) *Journal* came the announcement of a new monthly *Journal*, 2s 6d per copy, 30s per annum. Abstracts, too, were forecast. On January 2, 1918, Dr A. P. Thurston delivered a lecture to 500 "young people." His subject was "The Aeroplane." By March 1918 the cataloguing of the library had been completed.

The May 1918 number contained the announcement that His Majesty had been graciously pleased to confer on the Society the dignity of being known henceforth as "The Royal Aeronautical Society." This was announced at "the Wilbur Wright" on June 25. The council report for 1917-18 announced negotiations in progress for the formation of branches. These were contemplated at South Farnborough, Hendon, Glasgow and Manchester. Manchester Branch held its inaugural meeting on November 12.



Capt J. Laurence Pritchard, CBE, HonFRAeS, secretary from 1925 to 1951

In July 1919 it was announced that the Prince of Wales had consented to become patron of the Society. In the same month Faraday proffered his resignation from the secretaryship and in October General Ruck occupied the chair at a council meeting for the last time. When Frost ceased to be president in 1911, Ruck became chairman of council and the presidency remained in abeyance. In 1919 Lord Weir became president and Brig-Gen Bagnall Wild chairman of council. This arrangement persisted until 1927. Lt-Col Lockwood Marsh was appointed secretary on January 1, 1920. The new monthly *Journal* went up 9d to 3s 6d.

The first number of the *Journal* for 1920 bears the legend "Edited for the Council of the Royal Aeronautical Society by J. Laurence Pritchard, Associate Fellow. The March number announces the institution of examinations for Associate Fellowship. At the annual general meeting increased subscriptions were put forward, ranging from six guineas to one.

In July it was announced that the Duke of York had consented to become a patron, so the Society thus had two royal patrons at once. The election of Trenchard and Hunsaker to Honorary Fellowship brought this list to seven, previous recipients being P. Y. Alexander, Baden-Powell, W. H. Dines, Sir David Henderson and Sir Frederick Sykes. The Duke of York presided at the Wilbur Wright Lecture (by Hunsaker) that year. It is interesting to note that permission was granted for technical members to use the Air Ministry library on production of a letter from the secretary. One wonders if that permission has ever been rescinded. £850 in subscriptions was overdue in August.

The annual general meeting on March 31, 1921, heard the cheering news that the previous year's deficit of £1,780 had been reduced to one of £481 3s 4d. The balance sheet, however, still showed a debit of £1,542 19s 11d. The Council report announced that a more detailed system of bookkeeping would enable a more rapid check to be kept on expenditure! The Society's staff now numbered four, including a junior clerk—Miss F. Barwood.

In January 1922 the membership was down to below 1,000—879, but the income-and-expenditure account showed a credit of £136 17s 11d. The editor of the *Journal* received an honorarium—which he returned as a donation to the Society. In July the Carnegie United Kingdom Trust made a substantial grant for the purchase of 250 historical books, on aeronautical subjects, which Maggs Brothers were selling. January 1, 1923, showed an increase of seven in the membership. The full title of the *Journal* changed from *The Aeronautical Journal* to *The Journal of the Royal Aeronautical Society* and its subscription list numbered 136. The deficit was back at £278.

In 1923 the staff of the Society organized the International Air Congress, and it was felt that this "spread the gospel" of the Society's activities and existence. J. E. Hodgson, the well-known authority on old books, was appointed honorary librarian. Subscriptions to the *Journal* improved by 60 per cent. In an effort to economize it was decided to hold meetings in the library instead of at the Royal Society of Arts.

By the end of 1924 the total membership was but 817. Arrangements were in progress with the Institution of Aeronautical Engineers for amalgamation. The circulation of the *Journal* was up by 25 per cent and Pritchard was still editing it for love. Even so, expenditure still exceeded income. Two items of expenditure were obvious targets for economy: The *Journal* and administration. That the former was increasing in circulation rather pointed to the latter as the measure to be adopted. Lockwood Marsh accordingly tendered his resignation, which was accepted with regret. He had served the Society for five years. In the May *Journal* (1925) we read that "Mr J. L. Pritchard has, at the request of the Council, agreed to act as Honorary Secretary of the Society and took up his duties on May 1st."

In the August number were printed suggestions for the "exten-

OLDEST AERONAUTICAL SOCIETY . . .

sion of the activities of the Society," among which was a proposal for the formation of what are, today, the branches. The proposals were discussed at a meeting on September 15 out of which arose suggestions for graduates, informal discussions and "local societies." The December notices announced donations of £250 from the SBAC and the same each year for five years from the Air Ministry.

On January 12, 1926, the 60th anniversary was celebrated with a conversazione at the Science Museum. The hon librarian gave a talk emphasizing the historical associations of the Society. Membership was down to 740.

On April 13, 1926, Sir Sefton Brancker was elected President, from October the Master of Sempill was Chairman of Council, Pritchard was Hon Secretary. A formidable trio. On January 1, 1927, Pritchard was appointed Secretary.

The Yeovil Branch had been formed as from December 14,

centring on Westlands; a year or so earlier the Coventry Branch had come into existence. The February 1927 *Journal* announced that S. Scott-Hall had had to resign secretaryship of the Students' Section in order to take up an appointment outside London. On January 1, 1927, membership was 1,049, but this included 342 branch members. On January 27, members of the Society and of the Institution of Aeronautical Engineers met and agreed to amalgamate. In the annual report of the council for 1926-27 it was announced that an endowment fund stood at £582. In February 1927 the first six *Data Sheets* of the Society were issued; they were free to members who required them.

The Report for 1927-28 naturally shows an increase in membership, after amalgamation with the IAE. With branch membership it was now up to 2,940. In 1926 the Guggenheim Fund had made a grant of 5,000 dollars. In October 1927 a letter had been sent, describing how the money had been spent, with the result that a further similar sum had been forthcoming. Money seemed to be coming in from all directions. On May 31, 1927, a banquet was given to a man named Lindbergh; in July there was a lunch to Gen Balbo; and in October a banquet was given to the Schneider Trophy team. Most of these were combined efforts with the Royal Aero Club, the Air League and the SBAC. Those were the days!

In the report for 1929-30 it was announced that with a final grant of 10,000 dollars, the Guggenheim Fund's donations to the Society had totalled 25,000 dollars. The SBAC and SMMT and Air Ministry continued to give yearly grants of £250. At the International Aero Exhibition at Olympia a historical exhibit was arranged by J. E. Hodgson—the best of its kind that had ever been shown. The number of branches now numbered nine. Without donations the balance sheet showed a debit balance of £862. Donations made a credit of £981.

In June and July of 1930 the secretary visited Canada and the United States, and the Master of Sempill was succeeded as president in October by C. R. Fairey. A tribute to the Master of Sempill's work for the Society appeared in the December 1930 *Journal* over the initials J. L. P. On April 21 Maj B. F. S. Baden-Powell completed 50 years' membership of the Society. In 1931 was started a series of prepared lectures to Public Schools. In the last three months of the year 22 of these addresses were given.

In March 1933, the SBAC wrote a letter to the effect that they had watched the Society's activities for a number of years and were now convinced that a responsible post in industry should be given to an Associate Fellow or Associate Member in preference to one not so qualified.

In 1934 C. R. Fairey finished a four-year term of office as president and was succeeded by J. T. C. Moore-Brabazon. A tribute was paid to Mr Fairey for his work in improving the financial position of the Society.

At the annual general meeting on March 31, 1937, it was announced that His Majesty the King had been graciously pleased

Dr A. M. Ballantyne, TD, PhD, BSc, FRAeS, secretary since 1951

Below, left: Mrs Joan Bradbrooke, ARAeS, editor of the RAeS Journal; and Miss Florence E. Barwood, MBE, assistant to the secretary

to become patron of the Society. An obituary in the 1937 volume was that of Baden-Powell, who had died at the age of 77.

In 1938 the membership of the Society reached 2,000 and the threat of a second world war was looming large. The endowment fund had reached £12,000 and in 1939 the Society moved to its present premises on March 25; the formal opening was on June 16 and 17. In September war broke out. Arrangements were made for emergency headquarters in the country should conditions make it necessary and valuable records and material were removed from the library.

During the war years the membership was more than doubled. The Society's prestige inevitably increased, although its activities did not, perhaps, capture the public imagination to the extent that they had when aviation was still a novelty.

With the end of the war there was a certain amount of loins-girding. The technical department was largely re-organized, with a resulting increase in the issue of the *Data Sheets* that the industry now finds so useful. Even closer co-operation was made with the Institute of the Aeronautical Sciences by the establishment of the Anglo-American Conferences. In 1951, with the Brighton conference as his swan-song, Laurence Pritchard retired from the secretaryship after over 26 years of unselfish service to the Society. He was succeeded by Dr A. M. Ballantyne, who holds office today.

The progress of the Society in the past eight years will be common knowledge to most readers of *Flight*. The formation of specialist sections to deal with guided missiles, agricultural aviation, manpowered flight and aeronautical history is an indication of the Society's awareness of the present needs of aeronautical engineers and the interests of others connected with aviation. The *Data Sheets* produced by the technical department show not only awareness of the needs of the present but anticipate the requirements of the future. What the future holds one can but guess; but one might, without disrespect, suggest a motto for the Society in its aim to cope with lunar targets as well as with strange vehicles that hover just above the surface of the water—*Quo Vadis?*

The imposing library contains thousands of aeronautical works

At the Leszno Gliding Centre this new Polish tailless glider, Wampir 2, is now being evaluated. It was designed by Jan Dyrek, co-designer of the Mucha and Jaskolka, and has been test-flown by Adam Zientek

Sport and Business

TWO LANCASHIRE AIRCRAFT PROSPECTORS will be appearing at the Vienna International Trade Fair next month. One, equipped for spraying and dusting, will be exhibited in the British section of the fair, and the other, fitted as a passenger aircraft and glider tug, will make demonstration flights at Vienna Airport. Lancashire Aircraft have appointed Brita, Stanek, Blackburne & Co as their Austrian agents.

A PILATUS PORTER is to fly to Nepal next week for use in a survey of the route for the Swiss Dhaulagiri mountain expedition. Piloted by Ernst Saxer, one of the young Swiss "glacier pilots," the aircraft is expected to land on a small plateau at a height of 20,300ft, some 6,600ft below the summit.

ONLY THREE DAYS after his election as chairman of the Yorkshire Aeroplane Club committee, Michael Procter was killed on February 10 when his Proctor aircraft crashed in mist on the slopes of Roseberry Topping, near Guisborough, Yorkshire. He was flying on business from the Leeds-Bradford Airport at Yeadon to Newcastle, but en route had called Newcastle tower to say he was returning to Yeadon. Mr Proctor learned to fly with Yorkshire Aeroplane Club at Sherburn-in-Elmet in 1954, and was also a member of the former Yeadon Aero Club, an instructor to the Yorkshire Territorial Flying Group and an assistant instructor with Yorkshire Flying Services.

THE EXPERIMENTAL FLYING GROUP recently passed the 5,000hr mark in its grand total of hours flown, which represents an average of 500hr per year since members began flying in group-owned aircraft. During last year the group moved from Croydon to Biggin Hill, logged 711hr on Hawk Trainers G-AITN and G-AKAS and Auster 5 G-APBE, and gained ten new Private Pilots' Licences.

MAIN TYPES of British and foreign light aircraft available to the private purchaser are listed and illustrated in two small booklets produced by W. S. Shackleton Ltd, 175 Piccadilly, London W1. The company intends to make these available free of charge to clients, and states that other readers of *Flight* may purchase the booklets at "approximately 2s 6d" each.

FEDERAL AVIATION AGENCY APPROVAL has been obtained for the installation of higher-power engines in the Grumman Ag-Cat agricultural aircraft. Normally fitted with a 220 h.p. Continental, the new certification covers a 300 h.p. Lycoming and a 450 h.p. Pratt & Whitney. The Ag-Cat is manufactured for Grumman by Schweizer Aircraft Corporation (the builders of Schweizer sailplanes) at Elmira, New York.

THE TECHNICAL HIGH SCHOOL at Brunswick has designed, built and flown a new light aircraft called the Kiebitz. Powered by a 95 h.p. Continental, it is said to be noteworthy for its STOL capabilities. Cruising speed is 165km/hr and range 560km.

THE GREAT LAKES SPECIAL illustrated below is a prospective aerobatic contender for this year's Lockheed Trophy at Baginton. Owned and flown by Frank D. Price of Waco, Texas, the aircraft is powered by a 185 h.p. Warner engine. Performance data include: initial rate of climb, 2,300ft/min; cruising speed, 110 m.p.h.; and looping diameter (inside and outside) 350ft.

VENDAIR FLYING CLUB is now operating two Austers, a Tiger Moth, Proctor and Gemini at Biggin Hill. A night-flying programme has been drawn up by CFI John Richardson, and the club is offering a reduced contract rate for guaranteed periods of over five hours' flying.

THE POLISH TEAM for the World Gliding Championships will consist of Edward Makula, Jerzy Popiel and Adam Witek. These pilots, together with reserves, have been in training at a number of Polish gliding centres, and have included long-duration flights in the standing waves of the Tatra mountains.

AN ASIAN DEMONSTRATION TOUR of a Cessna 310D was begun in Tokyo earlier this month. Some 16,000 miles in 21 countries should be covered by the Cessna team before the tour finishes at the end of July. In April the 310 will be joined by a Model 210 for its trip through India, the Near East and the Far East.

RETROSPECT

From "Flight" of February 26, 1910

Bristol as a Flying Centre: Presiding at a meeting of the Bristol Tramways Company last week Sir George White, Bart., said that for some time he and his brother had been giving their attention to aviation, which seemed to offer promise of development at no distant date, and they had determined to endeavour to develop the science both from the spectacular and the manufacturing point of view. They had already ordered three aeroplanes with a view to testing them, and when they have decided which is best they hoped to start a factory at Bristol. Probably public demonstrations would be held during the coming summer, and this ought to secure for the tramways a new and important source of revenue, as they would take care to ensure that the demonstration ground was alongside the tramway lines. The flying meetings should attract great crowds to Bristol, which would benefit thereby.

This Great Lakes Special (185 h.p. Warner) may be among the aircraft visiting Coventry for this year's Lockheed International Aerobatic Contest. The owner and pilot is Frank D. Price of Waco, Texas

Hampshire Aeroplane Club members Joyce Kiel, Gillian Walker and Elizabeth Gauld, seen at Eastleigh with the latest version of the Currie Wot. This experimental aircraft has a 60 s.h.p. Rover 1S/60 gas turbine

THE INDUSTRY

Liquid Oxygen for the VC10

AN order for the supply of liquid-oxygen storage equipment for the Vickers-Armstrongs VC10 is announced by Normalair Ltd. In anticipation of the expected revisions of the Air Navigation Regulations, concerning emergency oxygen supplies, the installation will automatically provide a guaranteed reserve of crew oxygen independently of demand by passengers. A converter of 30 litres' capacity will be installed in each aircraft; it is probable, state Normalair, that the VC10 will be the first civil aircraft in the world to be fitted with liquid-oxygen storage equipment.

Two-in-one Test Plant

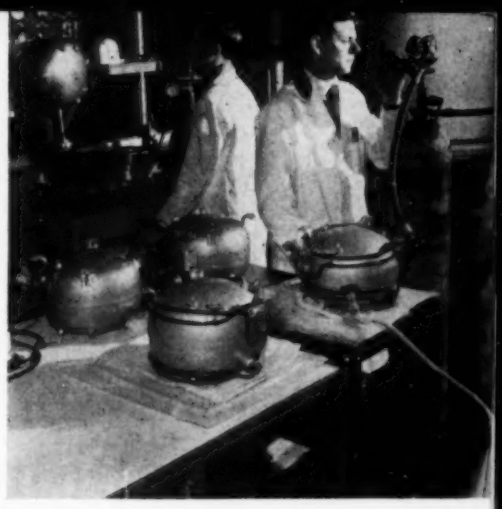
AN order has been placed by Rolls-Royce Ltd with Heenan & Froude Ltd, of Worcester, for test plant incorporating an engine thrust cradle capable of measuring forward thrust up to 25,000lb and reverse thrust up to 11,000lb.

In addition to the cradle, which will be installed with its floating frame at floor level, Heenan & Froude are to supply two special transporters designed for the movement of large engines through restricted spaces. These transporters will be used as engine mountings on the test cradle itself. This will be achieved by wheeling the transporter, complete with engine, on to beams which can be lowered on either side of the thrust cradle.

Teddington Divisional Board

IN a reorganization following the recent appointment of C. S. Gardner as managing director, Teddington Aircraft Controls Ltd have promoted four of their senior staff to form a divisional board of directors, which will be responsible to the main board for running the company's three works—the main factory at Merthyr Tydfil, which produces aircraft and industrial equipment; the bellows works at Ammanford; and the new premises nearing completion at Pontardulais. The divisional board consists of E. J. Bush (responsible for engineering), John Griffiths (sales), J. F. Martin (long-term development) and D. N. Steed (works and production).

Left to right: Messrs Bush, Griffiths, Martin and Steed



Five-litre liquid-oxygen converters from NATO aircraft undergo high-vacuum testing during overhaul at the Harlow works of British Oxygen Aro Equipment Ltd. The company's overhaul and repair of lox equipment is co-ordinated by British Oxygen Aviation Services, of Harlow, Essex

Warmth for Transparencies

BY a recent agreement with the Sierracin Corporation of Burbank, Calif, D. Napier & Son Ltd have been granted exclusive UK and European rights to manufacture and sell the "Sierracote" and "Sierraglo" processes.

The former is a transparent conductive coating for heating, de-icing and de-misting aircraft windscreens and cockpit canopies, in which application it could of course be used in association with the Napier Spraymat de-icing system already in well-established use for aircraft metal surfaces. "Sierracote," state Napier, is equally applicable to glass and all plastic materials used in canopies, and the latter can be formed to shape either before or after the coating is applied. The coating can be produced with any surface specific resistance between six and 90 ohms per square; irregular areas can thus be heated uniformly and a wide choice of operating voltages is possible.

On Living Dangerously

AMBITION, enthusiasm and initiative were qualities stressed by A. G. B. Owen, chairman of the Owen Organization, when he spoke at the annual apprentice prize presentation and parents' evening of Electro-Hydraulics Ltd and Rubery Owen (Warrington) Ltd in Warrington recently. Mr Owen, who is chairman of Staffordshire County Council, stressed the time and money being put into educational facilities nowadays and asked: "is the younger generation really rising to the opportunities that are available to it?" He suggested that in an organization like Owen, with firms in many countries of the Commonwealth, there was "wonderful scope for anybody who has ambition to get on." Urging that young people today should be prepared, as far as their job was concerned, to live dangerously—striving to get on—he told the apprentices: "you can have technical ability, you can have ambition, but unless you do your job enthusiastically then you won't succeed, you won't get to the top."

IN BRIEF

T.K.S. (Aircraft De-icing) Ltd announce that D. C. Tanner, formerly technical representative, has been appointed to their board.

Hong Kong Aircraft Engineering Co Ltd, one of the largest aircraft overhaul and maintenance firms in the Far East, have appointed Killick Martin & Co Ltd, Dunster House, 20 Mark Lane, London EC3, as their agents in Europe.

The commercial engineering division of Microcell Ltd has been formed into a subsidiary company known as Microcell Engineering Ltd. Members of the board are Henry Kremer, J. J. Molins, L. R. Rutherford, L. Avis (technical director) and D. J. Dolamore (works director).

Appointed to the board of Murex Ltd are F. W. Tomlinson, managing director of Pyrotenax Ltd; J. M. Willey, director and general manager of Murex Welding Processes Ltd; and P. S. Bryant of Murex Ltd. Mr Tomlinson has also been appointed to the board of Murex Welding Processes.

Brent Chemical Products Ltd, whose London and sales office is at Commerce Road, Brentford, Middx, announce an addition to their range of metal-cleaning products. Known as Ardrox 6015, it is an aircraft-surface cleaner of detergent type which may be diluted with up to 20 volumes of water. It is applied by brush or spray and then hosed off. In stronger solutions, state the makers, it will effectively remove exhaust tracks or oil stains.

To celebrate their 21st birthday year, Southern Instruments Ltd, of Frimley Road, Camberley, Surrey, are to design and manufacture 21 new products during 1960. The first is the G300 general-purpose inductance pressure transducer, a retracted-diaphragm model for use with FM systems. Other news from the company concerns the TRE12 trace reading equipment, already in use in the aircraft industry for analysing flight-test records. It can analyse any record up to 12in wide and 200ft in length, and each trace can have any calibration function added to it before digitizing. Comprehensive programming facilities are incorporated.

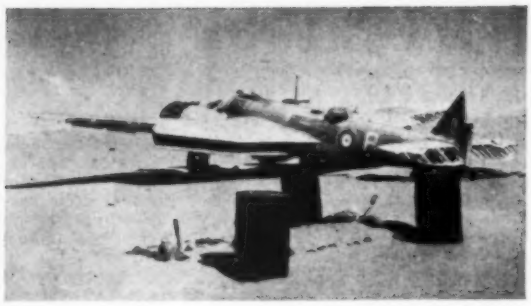
D.J. Equipment (Hersham) Ltd, of 43 Queens Road, Hersham, Surrey, have issued a leaflet on a new range of lightweight portable spot-welders. The smallest unit weighs 14lb and has a capacity of two 16 s.w.g. mild-steel sheets.

The American Endevco Corporation has announced that Sydney Marks, formerly with Goodman Industries, has been appointed manager of Endevco Ltd in London. He will co-ordinate sales and engineering services between the main plant in Pasadena and the UK and Europe.

Included in a film recently produced by Lewin Road Sweepers Ltd, of West Bromwich, Staffs, are sequences showing the Lewin runway sweeper-collector in use at London Airport. These tractor-drawn sweepers can either be used singly to give a 7ft 6in sweep or ganged in threes to sweep a width of 20ft.

Brig J. D. Haigh, OBE, MA, MIEE, has been appointed divisional manager of the Plessey Capacitors and Resistors Division at Swindon. One of Britain's first radar specialists, he was from 1939 until 1941 a radar instructor at the School of Anti-Aircraft Artillery and was subsequently at the MoS; in 1954 he was appointed Director of Electronic Research and Development.

Appointed to the board of Simmonds Aerocessories Ltd are five executive directors. Their names, and the posts which they occupied in addition to holding executive directorships are: A. Beard, chief production engineer; W. J. Burnell, chief mechanical engineer; S. H. Goss, general sales manager; A. P. H. Pehrson, export manager; and C. J. Williams, works manager. Mr Goss and Mr Williams are also appointed assistant managing directors.



Subject of the letter below from P. G. Masefield, managing director of Bristol Aircraft, this Blenheim has stood in the Cyrenaican Desert for at least sixteen years. Readers who served in the Middle East may be able to provide evidence that will help to solve the fascinating but grim mystery of its identity

Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

Middle East Mystery

READERS of *Flight* may be interested in information which we recently had sent to us about a Blenheim found in February 1959 some 100 miles north-north-east of the Kufra Oasis in the central Cyrenaican Desert.

A Dr A. J. Martin, who was a member of the geological field-party which discovered the Blenheim, wrote to us about it and sent us some photographs, copies of which are enclosed [two are reproduced above.—Ed.]. He said that the petrol drums in the foreground of one photograph mark a grave, and that considering the aeroplane had been standing in its present position for at least sixteen years the general state of preservation of instruments, etc., was good.

There were apparently no log-books in the aircraft, these presumably having been moved by the Army, together with the wireless equipment and guns. Dr Martin did say, however, that on the exterior of the fuselage were the letters RC and the number Z7513.

Research at Filton revealed that Blenheim 4L No Z7513 was manufactured by Rootes Securities Ltd at either Speke or Meir (Stoke-on-Trent) in about July or August 1941. It was the 1,615th out of a total of 1,870 of this variant built by Rootes. We believe it was about the 3,100th Blenheim of all marks to have been manufactured.

One photograph shows that Z7513 was fitted with fighter conversion modification, consisting of four Browning guns under the bomb cells, and the inference is that the aircraft had been engaged in ground-strafing operations.

The squadron code letters RC were allocated to No 5 LFS (presumably Low Flying School) but nothing is known here of the location or the dates of this unit. On the other hand, if the code letters could have been misinterpreted and if they are, in fact, CR instead of RC, the identity of the unit is No 162 Sqn, which was formed early in 1942 for special duties in the Middle East, including investigation of enemy radar and shooting-up land forces. No 162's equipment included Blenheims 4 and 5 as well as Wellington, Baltimore and Savoia-Marchetti S.79. This squadron was, in fact, a South African counterpart of its contemporary No 161, which flew Lysanders, carrying special agents in and out of France in support of the Maquis.

It is, however, a little unlikely that this Blenheim belonged to the SAAF, because it would have been given a new serial number composed of four numerals without any prefix letters. The roundel spot and fin flash would have been orange, not red, and would probably have bleached out completely in the sixteen years, whereas red, having an oxide base, would be more consistent.

Bristol, Som — PETER G. MASEFIELD

Crew-Training Manœuvres

A CORRESPONDENT in your issue of February 12 questions whether modern transport aircraft have a sufficient reserve of strength for crew-training manœuvres. These are the manœuvres, of course, which are necessary in order to increase the ability of aircrew to recover from feasible emergency conditions.

We have found that the loads caused in this manner can be significant. Such manœuvres are consequently taken into account in the design of de Havilland aircraft. As an example, an allowance has been made on the Comet for the buffet occurring in a reasonable number of stalls.

Therefore, there is no reason for any concern about the effect of a normal amount of crew-training manœuvres on the structure of de Havilland aeroplanes.

THE DE HAVILLAND AIRCRAFT CO LTD
Hatfield, Herts — C. T. Wilkins, Director and Chief Designer

Incantation

IN the halycon days of biplanes the ground handling equipment in the RAF consisted of a heterogeneous group of "erks" who could overcome the inertia of anything on wheels, provided that someone directed a collective effort by shouting the magic words, "Two-Six!"

I have been unable to trace the origin of this term, and would appreciate the use of your columns to air the problem.

St Lambert, Quebec — J. F. GRAHAM

Cranwell Apprentices' Reunion

YOU published in *Flight* for February 5 a very interesting article by J. C. Corlett which described the inception of the now well-known Royal Air Force apprenticeship scheme.

Certainly these Cranwell-trained apprentices were the prototypes of the many thousands who, ever since, have formed the technical background of the Royal Air Force.

A number of people who joined the Boys' Training Wing in February and September 1920 think it appropriate that the 40th anniversary should be marked by a reunion dinner in London during May.

Eligible ex-apprentices and instructional staff who are interested should write in the first instance to Air Cdre H. E. Nowell, CB, OBE, Norwich House, 4, Dunraven Street, London W1.

Hatfield, Herts. — R. C. GRINTER

FORTHCOMING EVENTS

Mar. 2. RAeS: Thirteenth Louis Blériot Lecture (in Paris), "Current Problems in Engine Design," by Dr E. S. Moult.
Mar. 4. RAeS Rotorcraft Section: "British Research on the Aerodynamics of Powered Lift Systems," by J. Williams.
Mar. 4. British Institution of Radio Engineers (South Midlands Section): "Radio Aids in Modern Transport Aircraft," by K. Fearnside.
Mar. 5. British Interplanetary Society: Symposium, "The Exploration of the Moon," by Patrick Moore, K. W. Gatland and W. N. Neat.
Mar. 7. Society of Instrument Technology (Data Processing Section): "Data Reduction for Guided Weapon Trials at Aberporth," by A. S. Younger.
Mar. 8. RAeS: "Electro Microcircuits," by Dr J. W. Granville.
Mar. 11. RAeS: Symposium on Vehicle and Instrumentation Problems in Upper-atmosphere Research.
Mar. 12. Air-Britain: a.g.m., Annual Recognition Contest and Film Show.
Mar. 14. British Institution of Radio Engineers: Discussion on Short-range Navigational Aids.
Mar. 15. RAeS: "Some Problems of Separated and Vortex Flow," by Prof H. B. Squire.
Mar. 15. Photogrammetric Society: "A Recording Stereo Comparator," by A. H. Anstis.
Mar. 16. Royal United Service Institution: "Rockets, Satellites and Military Thinking," by Sir Frederick Brundrett.
Mar. 17. RAeS: "Supersonic Aircraft—Promise and Problems," by M. B. Morgan.
Mar. 18. RAeS Agricultural Aviation Group: Film Evening.
Mar. 18. Institute of Navigation: "The American Air Traffic Control Programme," by Dr Hans Giesecke.
Mar. 23. Royal Aero Club: a.g.m.
Mar. 24. RAeS: "Mixed Powerplants," by Dr R. R. Jamison.
Mar. 24. British Institution of Radio Engineers (Scottish Section): Radio Guidance in Automatic Landing," by J. Shayler (at Glasgow; repeated on Mar. 25 at Edinburgh).

RAeS Branch Fixtures (to Mar. 4): Feb. 29, *Yeovil*, Fifth Henson and Stringfellow Memorial Lecture, "VTOL Aircraft," by D. Keith-Lucas. Mar. 1, *Luton*, An Historical Lecture, by C. F Uwins. Mar. 2, *Brough*, "The Boeing 707," by J. Sutter; *Preston*, "The Fairey Rotodyne," by Dr G. S. Hislop; *Swindon*, "Flight Testing of Modern Prototype Aircraft," by C. F. Bethwaite; *Weybridge*, "Space Flight," discussion by a panel of experts. Mar. 4, *London Airport*, Annual Dinner and Film Show.

SERVICE AVIATION

Royal Air Forces and Naval Flying News

No 70 Sqn members recently decorated for Mt Suphan rescue work last year. From left, Flt Lt R. Kingdom (MBE); Sgt J. Emmerson (BEM); Flt Lt R. Robertson (MBE); and SAC G. Murphy (BEM)

Speeding the Parting CO

A VICTOR of No 10 Sqn flew from RAF Cottesmore to Akrotiri, Cyprus, on February 15 in a take-off to landing time of 3hr 41min. This represented an average speed of 540 m.p.h. over the 2,000-mile distance, a new unofficial record. The aircraft was captained by Wg Cdr Charles Owen, who that morning had relinquished command of the squadron. His successor is Wg Cdr R. B. Phillips, formerly a flight commander on No 10 Sqn.

SHAPE Post

A NEW appointment at SHAPE from March 16 is that of Air Cdre B. Ball, Signals Officer at Bomber Command, as Deputy Chief Signals Officer. Among his previous posts have been membership of the British Joint Services Mission in Washington, which he joined in 1948, and Commandant and Chief Inspector of the Signals Division at RAF Debden (from 1951) before going to Air Ministry on operational requirements duties. He was made an OBE in 1943, when with No 26 Group, was mentioned in dispatches in 1945 and appointed CBE in 1946.

Signals Command Tourists

ANOTHER round-the-world tour is being made by the special Hastings aircraft, *Iris III*, of Signals Command. Captained by Flt Lt M. A. Sproule and carrying members of the RAF Inspectorate of Radio Services (from which the aircraft's name is derived), with Gp Capt E. C. Passmore as senior officer, the Hastings took off from RAF Benson on Monday last week. The purpose of this flight is to inspect signals facilities at Christmas Island in the Pacific and make liaison visits to the RAAF, RNZAF and Indian Air Force. The Hastings is going to New Zealand from Christmas Island and will return via Australia, Singapore, Delhi and Karachi, being due to arrive back at Benson on April 4.

New Career Structure

AT his Press conference on the 1960-61 Air Estimates last week the Air Minister, George Ward, laid great emphasis on the new officer career structure therein described—calling it "the highlight of this year's estimates." It was significant too that he should have had seated at his side the Air Member for Personnel, Air Marshal Sir Arthur McDonald, who explained the details.

Mr Ward filled in the background to the new structure by saying that it had been designed on lines suggested by the Grigg Committee, which had recommended giving officers a chance of retiring before 40 or a career in the Service until 60 or so. He said that all promotions after April 1 this year would be made on the basis of the new structure.

Sir Arthur, who was commissioned in 1924, said that the young man of today "tends to look further ahead than we did in our day. Now he has a career to 55, with a pension afterwards." Explaining the new scheme mentioned by the Air Minister for officers on the Supplementary List, he said that instead of leaving the Service after 12 years with £4,000 they would go on to leave after 16 years with a pension or could change to the General List or stay on the supplementary one till the age of 55. He explained that the old Branch List commissions for men promoted from the ranks in their early 30s would be maintained, and commented that the retiring age of 55—rather than 60 or 65 as in the commercial or professional world—had been decided on because up till then officers would still be medically fit enough to undertake rigorous assignments in any part of the world at short notice.

Rapier Bludgeoned

AS regularly as the Viscounts and occasional Caravelle or 707 making approaches to LAP behind the North Stand, the RAF mounted attacks on the Royal Navy's line in the earlier stages of the first of this season's inter-Services rugby union matches at Twickenham last Saturday; but by stout defence, and with occasional luck, the Navy held their opponents at bay.

It was clear from the start that if the RAF were to retain the Services' championship their lively backs would have to score in the first half with the wind behind them; and on about a dozen occasions, making rapier-like thrusts on both flanks, they came near to doing so: their nearest miss was when SAC Wood, within reach of the line, fumbled a difficult chance; and Fg Off Mettler was unlucky to hit a post from a penalty kick 30yd out, which would have given the RAF some morale-boosting points.

After the interval the Navy's weight told its tale: man for man heavier (especially in the forwards) and with a height advantage, they bludgeoned the RAF into defeat, although the Navy's play was generally more orthodox and less imaginative than that of their opponents. A try by Lt Pearey, which Surg Lt Fullerton converted, more or less settled the issue; and when Surg Lt Gaunt scored another try the Navy's superiority was thoroughly underlined, with the RAF looking at last a dispirited and well-beaten side.

Paying for Skill

ONE of the most interesting points in the Defence White Paper on Service pay and pensions, published recently, was what Air Ministry has described as "a new concept of trade pay." This will make a man's emoluments dependent in the future on three things—his trade, rank and qualifications. Among ground tradesmen benefiting most from the new selective increases will be such men as servicing chiefs in charge of ground crews on V-bombers, or responsible for the RAF's guided or ballistic missiles. The increases will also affect the recently introduced class of special tradesmen covering the propulsion, powered control or flight instrumentation systems of the Lightning, or the Britannia's propulsion system; and certain highly skilled men working on advanced radio and radar projects stand to benefit considerably.

Two different scales of pay are being introduced, Scale A relating to those trades which require the highest degree of skill and technical knowledge, and B to all other trades qualifying for trade pay. Rates under these scales are in addition to the new basic weekly increases, and like them come into force from April 1.

NEWS IN BRIEF

No 111 Sqn is this year, for the fourth time in succession, to provide the senior RAF aerobatic team. The reserve team will be drawn from No 92 Sqn.

This year's CFS Association Reunion Dinner is being held at RAF Little Rissington on Friday, July 8. Details are to be circulated to all members in due course by the hon secretary.

At the London UAS annual dinner on February 12 the CAS, Air Chief Marshal Sir Thomas Pike, presented the Spencer Trophy (for the best all-round squadron member) to Fg Off N. A. Kearns and the Bennett Trophy (for the most promising pilot) to Fg Off M. Lacey.

Two Shackletons from No 224 Sqn on a 14-hour routine training flight from Gibraltar dipped in salute over the *Capetown Castle* on February 14 and radioed greetings from the RAF to the Prime Minister during his homeward journey from South Africa. The liner was 255 miles south-west of the Canary Islands.

Air Chief Marshal Sir Philip Joubert has written an introduction to the latest Imperial War Graves Commission book *Their Name Liveth* (Vol IV, pt 2), containing details and photographs of burial grounds in the UK where lie Commonwealth airmen who died in the last war and including the Air Forces' Memorial at Runnymede. Copies may be obtained from the Imperial War Graves Commission, Wooburn House, Wooburn Green, High Wycombe, Bucks, at 5s 7d including postage.

The RAF Benevolent Fund has received £7,783 as a result of collections in churches during Battle of Britain Week last year.

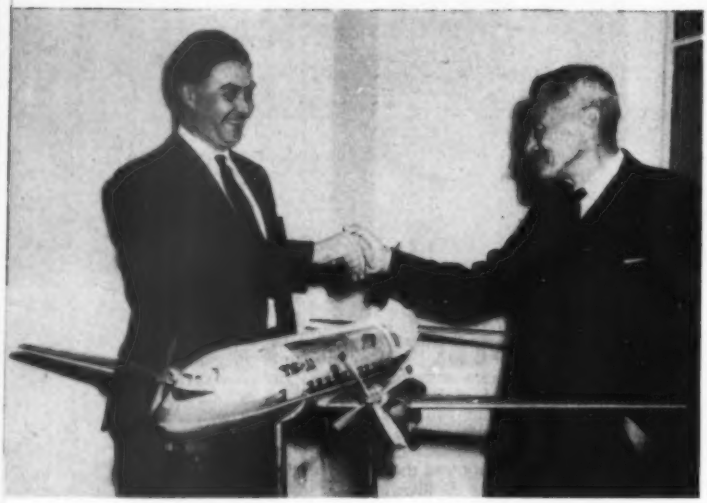
Two aircraft carriers, HMS *Ocean* and *Theseus*, are among ships the Admiralty is to dispose of as being surplus to requirements.

A marked upward trend in ROC recruiting is reported. Last year 2,754 men and women joined the Corps, bringing its current strength to 15,805.

Defence of a guided missile site is to be the main item in the RAF programme at the Royal Tournament, which is being held at Earls Court from June 22 to July 9.

The 600 City of London Sqn reunion dinner is being held at the Duke of York's HQ, King's Road, Chelsea, SW3, on Friday, March 4. Tickets (12s 6d) from the hon secretary, K. W. Battrick, 2 Nursery Close, Orpington, Kent.

The No 13 Group Efficiency Trophy was recently won for the second year in succession by No 3612 Fighter Control Unit, RAuxAF, based at Aberdeen. It was presented by the AOC, AVM H. J. Maguire, to the CO, Sqn Ldr J. Robertson, on February 21.



Commemorating last week's news that Rolls-Royce are to supply five Darts for the Japanese YS-11 prototype: D. M. Knight, contracts manager Rolls-Royce international division (left) and Paul Taizo Shoda, president of the Japan Air Transport Manufacturing Company, shake hands over a model. The resemblance to the Avro 748 is striking

AIR COMMERCE

BRITAIN GOES SUPERSONIC

LAST Monday's confirmation by Mr Sandys, Minister of Aviation, of design contracts for the Big Two members of the rationalized aircraft industry can be linked to the fact that the Hawker Siddeley Group is ready to place before the Government a proposal for a supersonic airliner. *Flight* understands that Avro would be the design leaders, and if the proposed design is accepted work will be divided among the member-firms of the Group. If there is to be a new manned bomber (the possibility is considered by the Group to be not so remote) then it is thought that Avro would be well placed to be associated closely with its development. This would follow naturally from their association not only with the supersonic airliner, but with their earlier Type 730 bomber, axed by Mr Sandys' White Paper of 1957. (For the 730 Avro are known to have developed a very advanced form of stainless-steel honeycomb construction.)

In his statement Mr Sandys said:

"I am examining with the industry the problem of developing a supersonic civil airliner. I am placing separate study contracts with each of the major airframe groups [Hawker Siddeley—de Havilland and Vickers—Bristol—English Electric] and with each of the aero-engine groups [Rolls-Royce and Bristol Siddeley], all of whom for some time past have been considering this problem. Firms have been asked to study the technical issues involved including the question of optimum speed as well as the economic prospects. They have also been asked to explore the possibility of collaboration with [foreign] firms."

There was, he said, no thought of placing contracts for two supersonic airliners. Thus the studies anticipate one contract involving many millions of Government aid over perhaps ten years.

Flashback: The recommendations in April 1959 of the Government committee set up in December 1956 to make a supersonic airliner feasibility study (twelve firms led by the RAE) were that two types should be considered—a medium-range M1.2 machine and a long-range M1.8 to 2.0 type. Meanwhile Lockheed, Douglas, Convair and North American have all said that a M3 transport is technically possible by 1965 (*Flight*, February 12, 1960, December 18, 1959, and February 6, 1959).

VC11 VERSUS D.H.121

ONE of Mr Sandys' objects in consolidating the British aircraft industry was the elimination of wasteful competition. It is obviously senseless for an industry to indulge in competition at home when its real competition is American. But inevitably our new Big Two industry inherits some competing projects; examples are the Airco D.H.121 and Vickers VC11.

Whilst de Havilland have released a great deal about the D.H.121, Vickers have made no official statement about the VC11 beyond confirming its existence as a project. The D.H.121 is the subject of a firm contract between the manufacturers and British European Airways, with price, delivery date and all other contractual details settled, design and static testing well advanced, materials ordered and metal being cut.

It was last August that the grapevine first buzzed with rumours about the VC11. It was said to be a smaller partner for the VC10, powered by four Rolls-Royce RB.163s. *Flight* was the first journal to draw attention to this project (August 28, page 92). It is now widely known that Trans-Canada Airlines have stated their readiness to be the first operators of the VC11 if—the usual dilemma—the manufacturer goes ahead, which obviously Vickers cannot do without an order or without Government support. And the Government, if it conforms *strictly* to its precepts for a rationalized industry, cannot support two overlapping projects.

Writing in the *Sunday Times* for February 14, Aubrey Jones, former Minister of Supply, and the first Minister to attempt to re-shape the aircraft industry, said:—

"There are two British aspirants to succeed the [Viscount], the VC11 and the somewhat smaller de Havilland D.H.121, both to a certain extent competitive with each other. Their presence offers the Government a prickly option of difficulties.

"Since BEA's choice has fallen on the D.H.121, the first order for the VC11 must come from abroad; indeed, such an order appears probable. The aircraft, however, cannot be built without some Government financial contribution, a contribution which might well be justified by the prize of a first foreign order. . . .

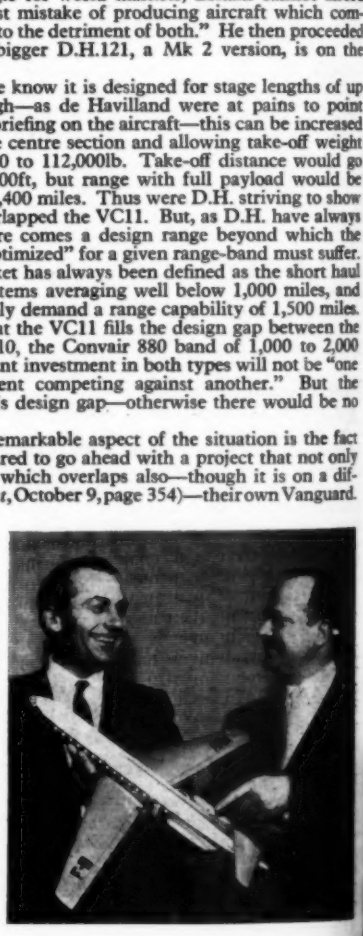
"But it is difficult to see how the Government can contribute to the VC11 without also contributing to the D.H.121. In that event, one Government investment would be competing against another to the reduction of the likely return on both."

But the Minister of Aviation, in his statement about the aircraft industry in the House of Commons on February 15, did not appear to rule out the possibility of support for VC11 as well as for the D.H.121. In answer to a question he said that the Government would not normally back competing projects, but "we are not starting with a blank sheet. I would not in the first stage rule out the possibility of supporting projects which overlap if commercial prospects justified it."

And the man who is now ultimately responsible for the destiny of the D.H.121, Sir Roy Dobson of Hawker Siddeley, said last week: "I see a danger in the Government backing two types of similar aircraft, as, for instance, the D.H.121 and the VC11. In the increasing struggle for world markets, Britain cannot afford to perpetuate her past mistake of producing aircraft which compete with each other, to the detriment of both." He then proceeded to announce that a bigger D.H.121, a Mk 2 version, is on the drawing board.

The D.H.121 as we know it is designed for stage lengths of up to 1,000 miles, though—as de Havilland were at pains to point out in a recent press briefing on the aircraft—this can be increased by putting fuel in the centre section and allowing take-off weight to go up from 105,000 to 112,000lb. Take-off distance would go up from 6,000 to 6,700ft, but range with full payload would be increased to beyond 1,400 miles. Thus were D.H. striving to show that their project overlapped the VC11. But, as D.H. have always consistently said, there comes a design range beyond which the economics of a jet "optimized" for a given range-band must suffer. The 121's prime market has always been defined as the short haul market, i.e., route systems averaging well below 1,000 miles, and which only occasionally demand a range capability of 1,500 miles. If it can be shown that the VC11 fills the design gap between the D.H.121 and the VC10, the Convair 880 band of 1,000 to 2,000 miles, then Government investment in both types will not be "one Government investment competing against another." But the VC11 does not fill this design gap—otherwise there would be no dilemma.

Perhaps the most remarkable aspect of the situation is the fact that Vickers are prepared to go ahead with a project that not only overlaps the 121, but which overlaps also—though it is on a different timescale (*Flight*, October 9, page 354)—their own Vanguard.



Hip hip Hereil! Another posed picture with model, taken just after Donald Douglas Jr (left) had signed the Caravelle contract with Georges Hereil of Sud Aviation on February 10 (see last week's issue)

AIR COMMERCE . . .

The Air Transport Licensing Board

ELSEWHERE in this issue, in a leading article and on page 283, a commentary on the new Civil Aviation (Licensing) Bill is given. Here is a summary of the main points in the Bill.

Its purpose is twofold: (1) to ensure proper standards of safety, and (2) to regularize the licensing system and to give the independents the same right as the corporations to apply for full licences.

Because some companies operating non-scheduled and charter services are not subject to sufficient control of their standards, the Bill provides that, without exception, all who engage in the business of operating aircraft must obtain an Air Operator's Certificate [Section 1 (2) (a)]. This will be issued by the Director of Aviation Safety of the Ministry of Aviation; it will not be the concern, so far as its issue is concerned, of the proposed Air Transport Licensing Board. This Certificate will ensure the necessary standards in equipment, organization, staffing, operational arrangements, and so forth.

The Air Corporations Act, 1949, gave to the corporations and their associates a monopoly of all air services. So long as the monopoly continued no licensing system was needed, but it gradually became accepted that the independents ought not to be excluded from scheduled services. There followed the increasingly hypocritical "associate agreements" between corporations and independents. Competitors have to pretend to be partners: the associate agreements were a legal fiction.

The time has come to regularize the position and to enable the independents to apply for licences in their own right. The new Bill ends the monopoly by repeal of Sections 24 and 25 of the Air Corporations Act, 1949, and by setting up an Air Transport Licensing Board. This will be responsible for issuing licences for scheduled and other important air services—such as inclusive tours and services operated by "closed groups." The ATAC will be abolished.

Those operators exempt from the requirement of an Air Service Licence (though not Air Operator's Certificate) include [Section 1 (3)] air ambulances, air taxis, crop spraying, aerial photography, and flights for which a whole aircraft is chartered by one person and not sub-let (as with closed groups and inclusive tours) to passengers paying separate fares.

The new board is required to give consideration when issuing an Air Service Licence to a number of factors [Section 2 (2)], the main ones of which are (1) the need for the new service, (2) the extent to which new service will result in wasteful duplication or material diversion of traffic from already existing services, (3) financial commitments or commercial agreements entered into by existing operators, and (4) "any observations made by the Minister."

Transitional arrangements [Section 2 (6)] are made to prevent the board from being choked by a flood of applications. The Bill therefore provides that the board shall automatically issue Air Service Licences to all existing operators, for a term to be decided by the Minister (it has been widely reported that 15 years is the term in the case of BOAC and BEA).

There will be a right of appeal [Section 5 (1)] to the Minister against any decisions of the Board though—if a comment can be injected here—there is no provision for right of appeal to an authority other than the Minister should he himself direct the refusal of an application, which he has powers to do under Section 2 (3), if the traffic-rights implications look difficult.

The expenses of the board, will, it is expected, be covered by fees payable in respect of licences.

The board will comprise ten members appointed by the Minister, who will appoint from these ten the chairman and the deputy chairman. Six members will form a quorum. No person with an interest in the business of operating aircraft can be a member of the board unless, having declared his interest to the Minister, he [the Minister] is satisfied that it is right and proper for him to become a member.

TRADAIR'S FREIGHT "VLF"

RATES 40-60 per cent below the basic IATA scale will be charged by Tradair on a new freight service to Germany and Sweden, unscheduled operation of which is to start within two months. Hamburg and Gothenburg are to be served by big-door Vikings operating from Southend and the operation is organized in such a way that although nine months have passed since Tradair's application to the ATAC was first heard, the German and Swedish governments have agreed readily enough to countenance the service on an experimental basis for one year. The Ministry of Aviation have given the scheme their blessing (and have of course undertaken the necessary negotiations) and the acquiescence of BEA—with whom Tradair are "in association"—has been given in spite of earlier objections as to material diversion and to tariff. The obvious analogy with VLF gives a special interest to this low-rate European freight service.

Tradair argue that their service will be a new concept in the carriage of freight. Consignments at present fall into two broad categories: those where urgency of delivery is of paramount importance and cost is secondary, and those where low cost is of much more interest than very rapid delivery. In general the former consignments are carried by air while the latter—in much greater bulk—go by sea. Tradair's suggestion is for a middle or "second class" of air freight, where bulk consignments are transported relatively quickly at a much lower fare than is general by air.

No single consignment of less than 1,000kg can be accepted; the "consolidation" by which small loads are lumped together to make up an aircraft load is not permitted by the licence and its absence may help to simplify the service. This bulk carriage is one of the considerations which persuaded the Ministry that there would be no material diversion of freight traffic from BEA. The other was that a limited delay in delivery must also be accepted. Tradair guarantee that any consignment will leave a maximum of 72 hours after acceptance; like VLF, the service relies on a low rate to generate sufficient demand and limited frequency to ensure high load factors. The rate charged is basic and varies only with the weight of the consignment; unlike the IATA tariff no commodity charges are applied. And although more valuable consignments may be subject, in the normal way, to a higher insurance premium, premiums will not be loaded to take account of the greater time that a consignment may be within the carrier's care.

In one respect Tradair dislike the comparison with VLF; while passenger Very Low Fares imply an austerity standard of airborne service, they say the second-class freight service does not. The only practical concession to the low rate is the possible despatch delay of not more than 72 hours.

The service is to start within about two months on an airport-to-airport basis, the charges for which are given below. Subsequently a door-to-door "Trukair" service will be operated in association with Atlas Air Express.

Applications to serve other points in Europe have already been put before the ATAC. At a recent hearing Tradair asked to operate other second-class freight services to Paris, Basle, Lyons, Milan, Dusseldorf and Berlin.

Sector	Rate per kilogram (pence)		
	1,000-1,999kg	2,000-2,999kg	3,000+kg
Southend-Gothenburg	18.24	15.96	15.2
Southend-Hamburg	13.44	11.76	11.2
Hamburg-Gothenburg	IATA rates	IATA rates	IATA rates

This is the start of Silver City's 100-car airlift to Le Touquet on behalf of the British Motor Corporation, restrictions by France on the import of foreign cars having recently been lifted. A new colour scheme, shown on the right, has been adopted for the Bristol Freighters

On flight test from Wisley is the first of the six Viscount 837s for Austrian Airlines. It will be officially handed over in Vienna on March 4

AIR COMMERCE . . .

DC-8s DELAYED

REPORTS that delays have occurred in Douglas' delivery programme for the intercontinental DC-8 have recently been confirmed by the manufacturer. At least three carriers are affected by the new schedule: SAS, Alitalia and Eastern, who expected delivery of their third aircraft only three days before their New York/Miami service was due to begin on February 14. The delays are due to the modification programme that Douglas have introduced to improve the performance of intercontinental models and which includes the revised wing tips of 16in greater span and wing slots.

FOR SALE: UAT's DC-8s

THE French independent airline Union Aéromaritime de Transport, *Flight* understands, is now trying to dispose of the two DC-8s which it ordered in November 1956. Among the airlines which have been approached, so far without success, is El Al. Delivery to UAT of their DC-8s (JT4-powered) is due to start in June. The contract, originally for three but cut to two by the French Government in 1957, has been reported as worth £3.93m.

Last autumn Roger Loubry, a director of UAT, confirmed for *Flight* (November 6, page 491) reports that his airline had been studying the Comet 4C, which he said appeared to meet UAT's requirements for a jet that would operate from African airports that the big jets could not use.

It may be fair speculation that UAT—like SAA—have been seriously concerned, too, about the size of big jets as matched to the African-European routes. There is the further consideration that DC-8 speed and range-payload capabilities are (see above) below expectations, though *Flight* understands that it is mainly on account of size and hot-and-high runway performance that UAT are having second thoughts about the DC-8.

BOEING WILL PAY

IT is understood that Boeing will assume financial liability for the changes ordered to be incorporated in all 707s now in service. This significant fact is not readily apparent from the wording of the Boeing statement last week, which says that "kits of parts will be furnished." Parts will be supplied free, though labour costs will be borne by the operators.

The changes, as expected, are those being made to the BOAC -420s at the request of the ARB. They include a 35in fin-tip extension, full rudder boost (at present only beyond 15°) and the small ventral fin.

Tex Johnston, Boeing's chief of flight test, told *Flight* last week that these improvements are "state of the art" developments deemed necessary in the first instance by Boeing, and not as the result of ARB requirements.

UK AIRPORTS IN THE RED

HEAVY deficiencies in the cost of running Britain's airports are revealed in the aerodrome accounts just published in the Comptroller and Auditor General's Report.* After paying £2½m interest on capital there was a loss of £6,366,247 on the 26 aerodromes operated by the Ministry; not one operated at a profit. Of this total, losses at London (revenue £3¼m, expenditure nearly £6m), Prestwick (revenue £0.6m, expenditure £1.1m), and Gatwick (revenue £180,000, expenditure £1.1m) accounted for over half; the eight social-service aerodromes in Scotland—which the Ministry do not hope to make pay—lost rather under £½m; and the other 15 aerodromes accounted for the remainder.

Of these latter, the loss on Stansted—which is held in reserve as an auxiliary to London's airports—was particularly heavy (£215,976) and it is not expected that this airport will become self-supporting; the future of Blackpool is under discussion; Croydon (on which the loss was £134,233) has been closed; and Blackbushe is to follow.

On the aerodromes which the Ministry hope eventually to make self-supporting (14 when Blackbushe is closed), the loss in the financial year ending March 31, 1959, was then £5.4m. By far the largest items of expenditure is on salaries and depreciation and, in general, most of the revenue comes from landing fees and apron service charges; the 7s 6d service charge on international passengers, the only other items of income related to traffic volume, is insignificant by comparison.

Revenue from incidental services is still disappointingly small. Of the total revenue of £3¼m at London Airport, revenue from concessions accounted for less than 6 per cent, while at Gatwick and Prestwick the percentage was even less. Income from another source of incidental revenue—the airport visitor—accounted for less than 3 per cent of earnings. Relatively, it was slightly higher at Prestwick than it was at London.

BEA BRINGS HOME THE DOLLARS

TICKET sales in North America bring BEA—and the Treasury—annual earnings of about $6m for an expenditure of about one-tenth of this amount, including commissions to agents. BEA's Canadian business is worth about $800,000 a year and that from the US West Coast about $200,000 a month. Further indirect dollar earnings come from sales to North American visitors after they have arrived in Europe.

These figures were given by Lord Douglas, chairman of BEA, after his recent visit to the US and Canada, during which he opened a new BEA sales office in Los Angeles and visited manufacturers on the US west coast.

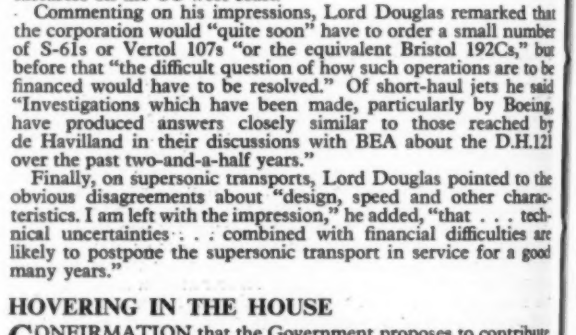
Commenting on his impressions, Lord Douglas remarked that the corporation would "quite soon" have to order a small number of S-61s or Vertol 107s "or the equivalent Bristol 192Cs," but before that "the difficult question of how such operations are to be financed would have to be resolved." Of short-haul jets he said "Investigations which have been made, particularly by Boeing, have produced answers closely similar to those reached by de Havilland in their discussions with BEA about the D.H.121 over the past two-and-a-half years."

Finally, on supersonic transports, Lord Douglas pointed to the obvious disagreements about "design, speed and other characteristics. I am left with the impression," he added, "that . . . technical uncertainties . . . combined with financial difficulties are likely to postpone the supersonic transport in service for a good many years."

HOVERING IN THE HOUSE

CONFIRMATION that the Government proposes to contribute to the cost to BEA of introducing the Rotodyne, and that this sum would be a maximum of £1.4m (see *Flight* last week), has been given in the House by Geoffrey Rippon, Parliamentary Secretary of the MoA. In the course of a short debate on helicopter services in the UK on February 19 Mr Rippon added that the special committee on London's heliports, appointed last July, hopes to present an interim report "fairly soon." Charing Cross is one of the sites being considered.

**"Trading Accounts and Balance Sheets 1958-59." HMSO, price 8s.*



Westland's heliport at Battersea, London, was last week granted a night-flying licence. Variable-intensity floodlights and perimeter lights were supplied by GEC to MoA recommendations and are supplemented by a 12-degree angle-of-approach indicator. An average of 200 movements a month is anticipated this year

NEIN

"ABSOLUTELY no justification for a new inquiry" was the Munich Airport manager's comment last week on reports that the inquiry into the BEA Elizabethan accident in February 1958 was to be reopened. The secretary of the German Airports Association, Werner Treibel, added that it had been established without any doubt that the cause of the crash was ice on the wings. "There is no other explanation," he said, "and there is absolutely no truth in the reports that it was slush on the runway or the inadequacy of the runway that caused the accident . . . there was only about three-quarters of a centimetre of snow on the runway at the time the aircraft took off." It remains to be seen whether this is the official German answer to the Ministry's request that they should consider the "slush" theory.

AIR TRAFFIC ASCENDENCY

THE flow of passengers to and from United Kingdom shores was up by about three quarters of a million during the first nine months of 1959, an increase more largely attributable to traffic carried by air than to that carried by sea. Shipping maintained the 5 per cent increase which it achieved in 1958 but air traffic to and from the UK increased by 12 per cent. Every air service to and from the UK carried more traffic than it had in the previous year but gains in sea traffic were mainly limited to the routes to the Continent, particularly to France and the Netherlands.

Air traffic on long-distance routes showed clearly the swing in allegiance from the sea to the air. On journeys other than those to Europe, 86,000 more passengers were carried by air while 16,000 fewer travelled by sea. Particularly was the trend noticeable where economy fares are in effect; although shipping services to Australia and New Zealand carried more passengers than in the previous year, passengers carried to the US dropped by 17,200.

"Flight" photograph

Seen at London being tanked up with 142,000lb (about 17,500 Imp gal) for its record non-stop 4,260 n.m. flight to Bombay last Sunday is the first of Air-India's three Rolls-Royce Conway-powered 707-420s. Flight time was 8hr 27min; on board were 12 crew and 34 passengers. Fuel consumption Seattle-London averaged 3,520lb/hr/engine at 33-37,000ft and Mach .82. Air-India will inaugurate five-times-weekly services to London early in April, and to New York on May 14

COMING SIR, BLACK AND WHITE

MARCH 3 could be an important day in the development of the Leeds - Bradford Airport at Yeadon. On that day a deputation from the Joint Airport Committee will go to London to discuss the chances of a grant with Ministry of Aviation officials. The deputation will include four members of the joint committee—two from Bradford (Alderman David Black, the chairman, and Alderman H. J. White) and two from Leeds (Alderman Frank O'Donnell and Councillor King) with the airport manager (Geoffrey Seller) and the town clerk of Bradford (Henry Patten).

FROM BERMUDA TO BARBADOS

THE talks now going on in Barbados between the world's two major civil air powers, the US and the UK, have been the subject of a good deal of recent comment. The *Daily Mail* ran a story with the appealing angle that a woman, Mrs Alison Monro, is to lead the British delegation. *The Times* gave the layman a "Guide to the Bermuda Agreement" in its issue February 22; and *The Economist* aired the subject in its "American Survey" on February 6.

The last-named drew from Peter Masefield, one of the original drafters of the Bermuda Agreement in 1946 and now managing director of Bristol Aircraft, a letter which neatly summarizes the Bermuda principles. The underlying one is that "there should be 'fair and equal opportunity' for the air carriers of the nations concerned to provide 'capacity adequate for the traffic demands.'"

The US abhors arithmetical predetermination of capacity, so common in other international air agreements, and the UK bowed to this in 1946. We agreed that each side would reasonably relate capacity to traffic demands—with *ex post facto* consultations if one side felt a route was being swamped by the other. Mr Masefield says that this principle is worthy of continuation.

It seems that, in fact, the Bermuda principles are considered by both sides to be "worthy of continuation," and that the agenda of the meeting in Barbados probably does not include an item to the effect: "Let's re-write the agreement." It is the annex to the agreement that is causing so many difficulties. This annex sets out the routes to be served by the air carriers of each country, and they have been much modified since the original agreement was signed on February 11, 1946. A good many conflicts have arisen, most infamous of all being BOAC's desire to "write in" Tokyo under Section IV(b) of the annex. One thing is certainly on the agenda—"Let's talk about Section IV(b)."

The precise wording of this section is as follows:—

"Other route changes desired by either Contracting Party may be made and put into effect at any time, prompt notice to that effect being given by the aeronautical authorities of the Contracting Party concerned to the aeronautical authorities of the other Contracting Party."

It was on the strength of this that BOAC wanted to "write in" Tokyo on its Route 7 in the annex. There was never any actual written agreement about this, but it is generally accepted that in January 1957 there was a gentlemen's agreement to this effect. As is well known, the cumbrous CAB procedures (also on the agenda?) delayed BOAC's service for many months. Northwest fought the matter tooth and nail, on the grounds of diversion of traffic that would not be in the American "public interest." But the Americans eventually honoured the gentlemen's agreement.

The Tokyo business will, we have no doubt, be uppermost in the minds of the delegates from both sides in the Barbados. It is no secret that Northwest want traffic rights at Hong Kong, and that they have been designated by the CAB for the Tokyo - Hong Kong route in parallel with Pan American. But the UK will probably not readily concede this demand as a "trade in" for BOAC's Tokyo rights, which the UK regard as an equalizer for the many points previously written in by the Americans. We contend that the Americans have taken advantage of Section IV(b) more often than we (16 points added between 1946 and 1955, compared with our 4 between 1949 and 1954). The Barbados negotiations, so far as UK route horse-trading is concerned, start off "at par."

What other points of conflict are there? As we say, the broad Bermuda principles are not in question. This indeed was one of the few points officially made to *Flight* by spokesmen for each side before the Barbados meeting. One of the others was that the meeting was just one of the many consultations provided for in Article 13 of the agreement. So the agenda boils down to an attempt to settle some of the outstanding route requirements of both sides. Observers of the air transport scene can safely assume that these "problem areas" include the following:—

(1) Pan American desire to operate a through jet service from New York to Jamaica. It will be recalled that PanAm went ahead and operated two such flights—which are not provided for in the annex to the agreement—early last month, by "joining up" the legitimate New York - Ciudad Trujillo - Jamaica sectors by the simple device of changing flight numbers at Ciudad Trujillo without requiring the passengers to change aircraft—a Boeing 707. Stormy protests were raised by the Jamaican Government (who are represented at Barbados).

(2) TWA for many years have wanted "beyond" rights out of London to the Middle and Far East. Already they operate a route to Bangkok, an extension of their North Atlantic service to Paris and Rome. We have stubbornly resisted this, and at the moment TWA's London service is extended only to Frankfurt. Both BOAC and BEA fear material diversion of their traffic. Nevertheless, TWA are pressing their demands very hard and, for good measure—though they do not appear to have the slightest hope of success—they also want to join up Bangkok with Hong Kong and Tokyo.

(3) BOAC want to take advantage of the rights enjoyed by BCPA (merged with Qantas in 1954) on the South Pacific route (Route 8 in the annex) between Australia/New Zealand and San Francisco via Fiji. Some conflict here with Australia is not beyond the bounds of probability; Qantas, since Australia bought the UK and NZ interests in BCPA, exercise the rights it enjoyed.

(4) Eagle Airways Bahamas want not only Miami, which they were recently granted, but also Fort Lauderdale, West Palm Beach and Tampa. The US airline Mackey has fiercely resisted this before the CAB on the grounds that Bahamas Airways (Eagle's British competitor on this route) has already been granted these points. This little battle, reviewed in *Flight* for January 29, is significant in that it emphasizes a new British desire for "double designation of carriers." BOAC is no longer the chosen instrument; the Ministry negotiators are already having to put to the US, as they will have to more and more in the future, the route desires of our independent airlines. It is no secret either (*Flight*, January 29) that Eagle Airways Bahamas want deep penetration routes into the US to Atlanta, Jacksonville and Chicago. These desires have the full support of the Bahamas Government.

To sum up: the Bermuda *principles* are agreed; it is the annex defining the routes that is the subject of conflict. J. M. R.

AIR COMMERCE . . .

UK's BUSIEST AIRPORTS

THE ten busiest UK airports, according to figures for November recently released by the Ministry of Aviation, were as follows: (1) London (234,933 passengers handled); (2) Glasgow, Renfrew (32,346); (3) Manchester, Ringway (28,551); (4) Belfast, Nutts Corner (19,000); (5) Prestwick (17,765); (6) Jersey (13,014); (7) Gatwick (12,824); (8) Birmingham, Elmdon (8,450); (9) Edinburgh, Turnhouse (8,448); (10) Liverpool, Speke (6,397).

In terms of passenger movements, second on the list after London (7,496) was Ferryfield; there were 1,744 movements at Silver City's airport in the month concerned.

Air transport movements at UK aerodromes as a whole in November 1959 numbered 19,877, an increase of 22 per cent compared with November 1958. The number of passengers handled increased by 28 per cent to 415,263. Freight picked up and set down amounted to 16,603 short tons, an increase of 62 per cent.

Airports in the London area as a whole showed an increase of 8 per cent in air transport movements, and an increase of 22 per cent in the number of passengers handled. At London Airport there were 7,496 movements, an increase of 7 per cent compared with November 1958, and 234,933 passengers were handled, an increase of 22 per cent.

BOAC's CHAIRMAN

MANY people, including John Rankin, MP, must have been wondering whose will be the firm hand on BOAC now that Sir Gerard d'Erlanger's retirement in April 1961 is public knowledge. Mr Rankin asked the Minister in the Commons recently whether he was aware of the difficulties that had arisen in BOAC with the present set-up of a part-time chairman, a full-time deputy chairman and a full-time executive. The Minister said that he was aware that this difficulty existed, and that he would give due weight to it when deciding on any future appointment.

Douglas meets Douglas: BEA's chairman with the president of Douglas Aircraft during a recent visit to Santa Monica. For BEA's role as a dollar earner see page 292

BOAC JOINS AIR UNION!

"AIR UNION" is the confusing name which has been given to an association of European airlines which are co-operating to provide joint ground servicing at Idlewild Airport. Yet this ground-based Air Union is not entirely disassociated from its European namesake; three of the five airlines involved—Air France, Lufthansa and Sabena—are members of the European Air Union. The other two associates are BOAC and KLM.

The association became active on January 28 when some of the first ground servicing equipment was delivered—three pneumatic engine starters for the Union's Comets, Boeing 707s and DC-8s. This is the Atlas Copco Air Partner rotary-screw compressor mounted on a Ford truck, a photograph of which appeared in *Flight* for February 5. It is claimed that in trials of the Air Partner starter the operating cost per start averaged less than 60c per engine. Similar equipment is to be used by the Allied Maintenance Corporation, the major ground servicing firm at Idlewild.

BREVITIES

Kidlington airfield, Oxford, has been acquired by the Pressed Steel Company from Oxford Corporation on a 21-year lease.

Western Air Lines have ordered three Boeing 720s and taken an option on "at least one more." Orders for the 720 now total 53.

Cambrian are to increase their fleet to five DC-3s (all purchased from BEA) for the summer season.

Alitalia's Caravelles are to enter service on April 15 on a daily non-stop service between London and Rome. A second service via Milan will start on June 3.

PanAm has designated DC-8C its Pratt and Whitney JT4-powered Douglas DC-8s. The first of a fleet of 21 has just been delivered; the remainder will follow throughout this year and early 1961.

Morton Air Services have applied to the ATAC to extend their London - Swansea - Brawdy service to Cork, eventually with DC-3s and Viscounts.

SAS has placed a further order for a Caravelle, presumably to replace the aircraft which was destroyed in the accident near Ankara on January 19. SAS/Swissair have now placed orders for 18 Caravelles.

It is reported from Russia that Tupolev is working on the prototype of a medium range design known as the Tu-124. Engines would be "new" and designed by Solovyev.

According to the Boeing publication *707 Jet Lines* Continental's aircraft mile costs for the Boeing 707-120 are $1.54 and break-even load factor 41 per cent.

A seven-man team from Japan Air Lines has been studying the Comet 4C, Boeing 720 and 720B, and the Convair 880 Model 22M for international routes in S.E. Asia and the proposed route through India to Europe. The Convair 880 seems to be most favoured and if it is purchased delivery of three would be taken before June 1961.

BOAC men in the news: (left), F. C. (Freddy) Gillman, OBE, chief press and information officer, has been elected chairman of the Council of the Institute of Public Relations. Right, Michael Clapham, first BOAC representative in Cairo for 3½ years

Jordan has approved the Arab League plan to establish a united Arab airline. Initial capital for the union would be about £17 million.

Both Eastern Air Lines and Braniff have recently been examining the Boeing 720 for use on their medium range routes.

ARB announce the issue of Notice to Licensed Aircraft Engineers and to Owners of Civil Aircraft No. 15, Issue 2, dated February 1.

Douglas may soon offer a do-it-yourself kit to convert DC-7s into the DC-7F all-cargo configuration.

The designation Caravelle 6RU will probably be used for United Air Lines' aircraft indicating that reverse thrust is fitted and that the customer is United.

It is reported that the Argentinian operator Avenca has placed an order for one Convair 880. Another airline negotiating for the same type of aircraft is said to be Northeast, who may purchase six.

After exhaustive tests the FAA has cleared for operational use the Kollsman drum-pointer altimeter of the type installed in the American Airlines' Electra which crashed on approach to La Guardia last year.

The FAA Enforcement Division has suspended a National Airlines' pilot for 15 days for refusing to make an ATC altitude change and refusing to comply with a request to make a 360° turn to delay his flight. He was also charged with falsifying a position report.

Chicago Helicopter Airways has placed an order for an additional two Sikorsky S-58s to bring its total fleet to eight. The airline carried 205,000 passengers last year and has six S-61s on order for delivery in 1961.

A Comet 4 on an Aerolineas Argentinas training flight caught fire after a heavy landing at Buenos Aires Airport on February 20. The crew of nine escaped but the aircraft is reported to be a total loss. Aerolineas' Comet fleet is now reduced to one, another aircraft having been destroyed in a landing accident last August. Three more, due for delivery by June, are on order.

The Lebanese freight operator Trans Mediterranean Airways is reported to have lost its Persian freight contract to Lebanese International Airlines, and is consequently experiencing crew redundancy. Delivery of a third DC-4 is being taken, however, and in an attempt to overcome difficulties encountered in getting Persian traffic rights the company has registered one of its Yorks in Syria.

US railways are seeking legislation which would permit them to acquire major financial interests in airlines. A representative said recently that "air carriage is the fastest growing form of transport in the US. As it continues to grow . . . it will divert more freight from surface carriers and, if they are not allowed to have effective ownership in air carriage, they will have to stand by helplessly and watch anew this diversion of traffic to a new technology."